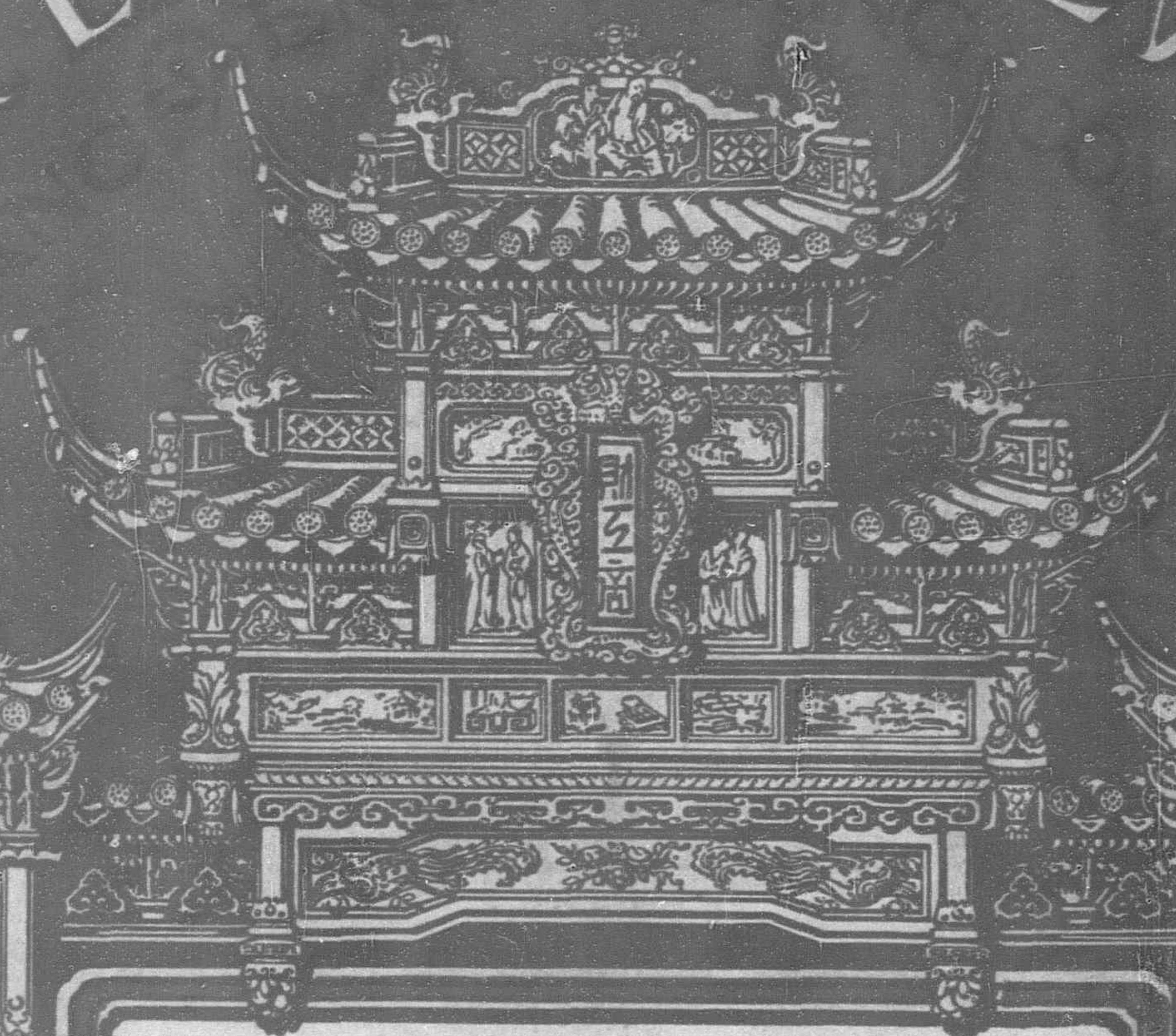


# THE EASTERN REVIEW



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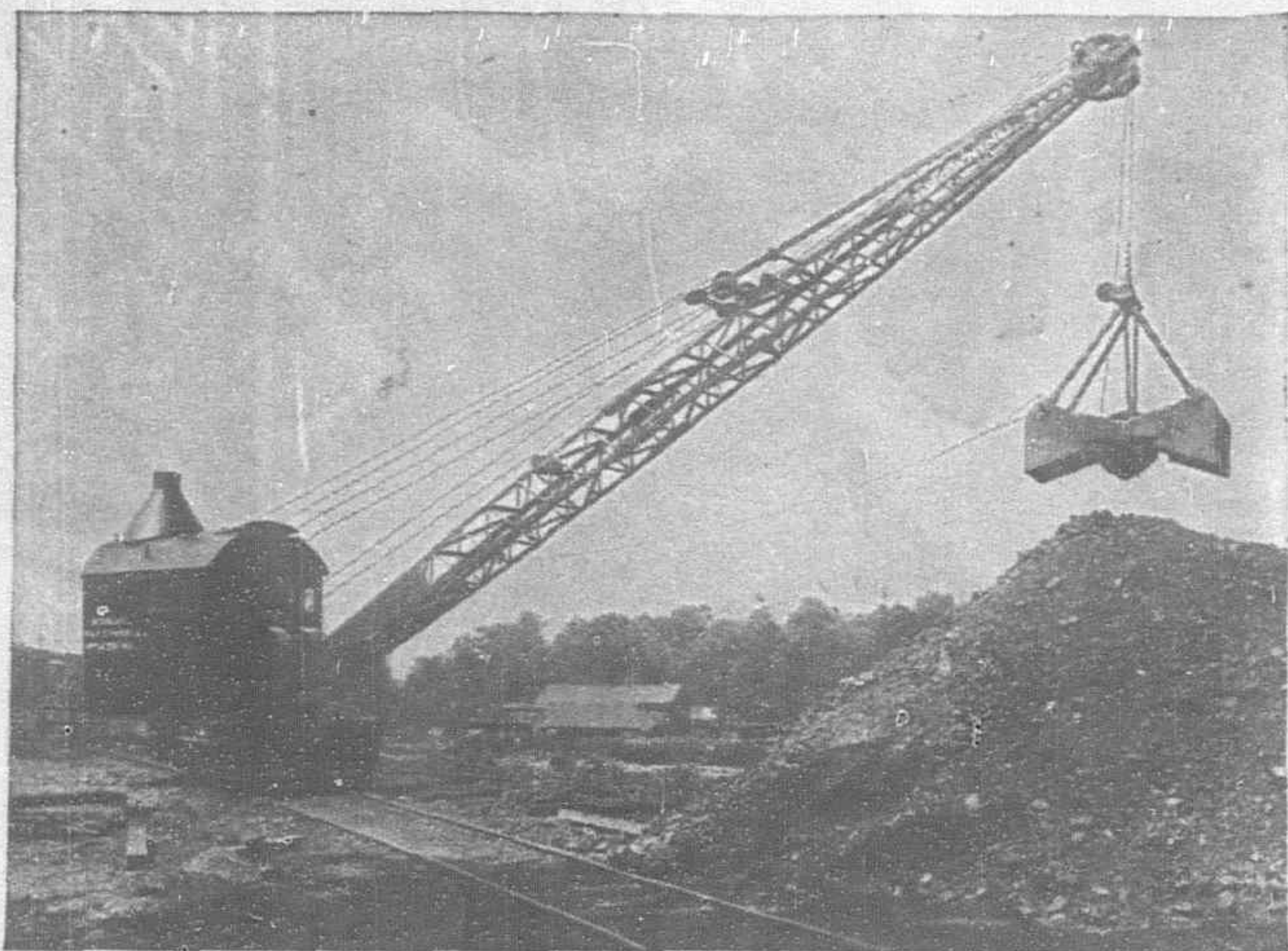
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# The Far Eastern Review

ENGINEERING

FINANCE

COMMERCE

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No. 11

## The Noose Around Japan's Neck

### What Happened at Geneva?

#### AN EXPLANATION

**W**HAT really happened at Geneva? Briefly this: suppose nation A has a grievance against nation B and lays the matter before the world court. If the court rules that the question is purely B's domestic affair, nation A still has the privilege of appealing to the council of the league instead of accepting the decision of the world court as final and binding. As originally drafted, the league plan tended to support America's position based on the law of nations that domestic questions are not subject to international meddling. Under that plan a world court decision would tie Japan's hands and proclaim her the aggressor in the event of war. Japan proposed that any nation, league member or not, that refused arbitration or its findings should be judged the "aggressor," even where a reluctant nation held the issue to be one affecting its domestic welfare and sovereign rights. Then, if such a nation refused to accept arbitration, she will be declared the "aggressor" and the other nation could make war with the support of the league. The Japanese won their point and the appellant nation may now take the decision of the world court to the council of the league and pray for friendly intervention. If the other nation refuses to follow the court's decision it becomes the "aggressor." In keeping the record straight Japan nearly busted the league and for all practical purposes made it impossible for the United States to ever become a member state because of its irrevocable stand over the immigration question.

The press of America saw in all this a direct challenge, a menace of war, while many newspapers seized the occasion to advocate larger naval appropriations and to prepare for the hostilities they now seem to think inevitable. How they get that way, the Good Lord only knows.

There is another side to the Geneva incident, which as usual went over the heads of the good people assembled to straighten out the world's affairs and for the lack of a Far Eastern expert at the conference the American people were led to believe that Japan's attitude clearly presaged an intention whenever she is ready, to provoke a quarrel over racial equality.

To understand the other side of the incident it is essential to keep in mind that Japan does not and never has challenged the right of the United States to enact its own immigration laws or to say who shall or shall not enter the country as immigrants. Her grievance is that we handled the matter with an absolute disregard for the conventions. We insulted her and made her lose face, something that was carefully avoided by Great Britain in acquiescing in the exclusion of the Japanese from her over-seas dominions.

Japan, however, accepts the situation. More than all the nations of Europe she realizes the great strength which has elevated the United States to the status of a super-power. She knows that no one nation or combination of nations would dare to attack us. Her own future security and national prosperity depend so largely upon her trade with America, co-operation in the development of her industries and resources and mutual regard and friendship that under no conceivable circumstance would she jeopardize this by any foolish gesture of diplomacy.

However, there is one possibility that will cause Japan to fight. Let us once more recapitulate the conditions: America,

Canada, New Zealand, Australia and British South Africa have definitely closed their doors to Asiatic immigration. Japan does not question their right to do this. America has followed this up by extending her Asiatic exclusion laws to an Asiatic dependency and enacted further laws which prohibit the Japanese from owning or leasing lands in the Philippines. Although this comes very close to her doors and bars her people from finding homes in a neighboring country, she is content to await the outcome of the independence movement. Some day the Philippines will open its doors to the Japanese. It will come naturally. Japan will not go to war to force this.

Russia, that is, Eastern Siberia, is practically closed to the Japanese. The Russians do not want them and place all manner of obstacles to their acquiring rights in that territory. Through the pressure of American diplomacy, Japan was compelled to withdraw from Siberia and forego the advantages that would have materially assisted her in coming to a proper understanding with Russia. This outlet is also closed for the present. There is an angle to this Siberian question little understood by Americans or Europeans. Japan is a fish-eating nation. She has no vast grazing lands upon which to raise a meat supply. The Sea of Japan, the Gulf of Tartary and the Okhotsk Sea with their littorals and connecting waters are to Japan what the prairies of the west and Canada are to America. Deprive her of the right to fish in these waters and the people of Japan starve. Yet even the fishing rights in Siberian waters are held by Japan under treaty with Russia, a treaty wrung from the latter by force of arms (the treaty of Portsmouth). The Soviet has done everything possible to cancel this treaty and place obstructions in the way of Japanese fishermen in the Okhotsk Sea, an attitude which at one time under Wilson seemed to receive the support of the American government. The fishing rights in Siberian waters are held by Russia as a purely domestic prerogative.

There is just one possible outlet for Japan's millions, one undeveloped store-house of essential raw materials and food supplies that will permit her people to live at home. This outlet lies in Manchuria and Mongolia, a right won by paying the price that every other fighting race has paid in the course of history for its expansion. Japan has over three billion yen invested in these territories in legitimate undertakings. Yet, she may not own or lease land therein. Her people cannot settle there and enjoy the fruits of their labors. The land laws of California and the Philippines find their exact counterpart in the laws of China. Furthermore, every now and then without any apparent reason, the Chinese central or provincial governments suddenly proclaim an embargo on the export of cereals. This same embargo may at any time be extended to other essential foods and raw products, all purely domestic affairs of China.

Even at this, Japan has accepted a situation that would cause any self-respecting white people to fight. Japan will solve her problem of over-population not by forcible expansion and the seizure of outside territory but by industrialization at home, and the development of food supplies and sources of raw materials within the empire and in those territories in which she has acquired certain rights by diplomacy and the force of her arms.



Japan presents the picture of a nation condemned to stand on its own feet in a water-tight compartment with no liberty of movement. A slack noose is around her neck permitting a certain freedom in one direction only—in Manchuria and Mongolia. Deprive her of this slight breathing room, destroy her possibility of maintaining life and expose her national security to attack from this quarter, and Japan goes under. The postponement of Philippine independence for another twenty-five years and the establishment of the British naval base at Singapore has drawn the noose tighter.

Let us now get back to Geneva. Some weeks before Japan threw the monkey wrench into the smoothly oiled machinery of this international debating society, the Chinese delegates announced their intention to bring before the league the question of the validity of the 1915 treaty which prolongs to 99 years Japan's lease to Kwantung and Fushun and extends her control over the South Manchuria Railway to a like period. This is the third time within two years that China has attempted to raise this issue, each time counting on American sympathy to carry her point. Japan has steadily refused to consider the question. With her it is a purely domestic affair.

Suppose that China brought her case before the court of nations and received a judgement that would place Japan in the position of an aggressor and bring down on her head the combined pressure of all the powers in the league to force her to get out of Manchuria. Consider this question in all its ramifications and bearings on the future of Japan and we will begin to realize something of what was in the mind of the Japanese delegates at Geneva. Japan will never go to war with America over immigration. She will, however, employ every diplomatic weapon possible to keep this question alive and before the world and by all peaceful measures endeavor to modify the American viewpoint.

On the other hand, Japan will fight if the noose around her neck is drawn any tighter. America knows this. So do the other powers who understand the situation. The Chinese delegates were preparing to throw the loose end of the rope over the roof tree of the Geneva conference room and invite the delegates to swing Japan into eternity. The performance was stayed by clever and rapid diplomacy. In saving herself, Japan, aided by American correspondents who knew nothing of Far Eastern affairs, focussed attention on the racial issue, and lined up the league against the United States. Incidentally, Japan put one over on China.

China has what she considers a good case against Japan. Japan has an equally good case against China. Any resurrection of this old question before a world court would have to go back of the 1915 treaties and the twenty-one demands to Portsmouth and still further back to the root cause of all modern Far Eastern troubles, the secret alliance between China and Russia of 1896. As it is, Japan stands pat on the accomplished fact, determined to oppose any outside interference in a matter which she considers as definitely settled. She has staked her existence twice on the plains of Manchuria and may have to do it again. Economically and strategically her national security still hinges largely on her position in this territory.

A purely domestic issue between nations is not confined to Japan's grievance over our immigration laws. There are, as we have pointed out, other more vital questions that affect Japan's position and which may compel her in self-defense to appeal to force in order to survive in the struggle for existence. As *The New York World* points out:

"It is a proposal which touches bottom in the writing of international law, and the world will have no trouble remembering disputes arising out of 'purely domestic matters' which have spread far beyond domestic frontiers. Was it a 'domestic matter' for Serbia to punish the conspirators who assassinated the Archduke Ferdinand? Austria's insistence upon defining what constituted punishment and proper satisfaction served as a starting-point for the European war. Was it a 'domestic matter' for Spain to administer Cuba in any manner she saw fit? The United States did not think so in 1898. History is full of 'domestic matters' which boiled over the kettle and started war."

Might not the Cuban situation of 1898 be duplicated in China? Under certain conditions it is easy enough to precipitate a situation through bad government or as a result of the present political chaos in this country that would vitally affect the very existence of Japan. These, however, are purely domestic affairs of China over which the league would have no jurisdiction. Would it be wrong for Japan to defend her existence against such a menace?

Japan is right when she contends that there many purely domestic matters which have a direct bearing on international peace.

The example of the United States in the racial question has been contagious, spreading to all Anglo-Saxon over-seas possessions and with every probability of its spreading to South America. Embargoes or the imposition of high export duties on food or raw materials are also the purely domestic concern of the individual nation, and in the case of a country situated like Japan might well convey its death-warrant if carried out by China supported by the civilized world bound together in a league of nations to enforce its laws. Japan's moral victory at Geneva carries no menace to America. It was simply the gesture of a people who invite the attention of the world to a situation that will have as great a bearing on future wars as racial discrimination.

The problems of peace are not centred in the settlement of Japan's disputes with America. The peace of the Far East is a matter in which America has only an academic interest. Japan intends to solve this problem in her own pacific manner and can accomplish her purpose only with the most carefully nurtured international good-will, by vigorously stimulated tolerance, by steadily developed even-handed justice and by the elimination of national ego and overvaulting ambition. The peace of the Far East no longer depends upon the strict observance of the open door and other academic considerations. Peace, enduring peace, can be assured only when some humane consideration is given to those problems which confine Japan to work out her salvation within a water-tight compartment with a noose around her neck.

## Far Eastern Contracts Placed in Britain

**F**AR Eastern contracts placed with British firms have recently been somewhat on the slim side, and the chief ones recorded during the past few weeks are noted hereunder.

### LOCOMOTIVES FOR INDIAN RAILWAYS

The Avonside engineering works of Fishponds, Bristol, have just received an important contract for 7 heavy tank locomotives for the Indian railways. These engines have been specially designed and are of a particularly robust construction, the line for which they are being built being 5 feet 6-inch gauge. The locomotives are fitted with Walschaert valve motion. That they are eminently adapted to the requirements of the line is testified to by the fact that the present order is an exact duplicate of one received by the same company some little time back for a similar number of engines.

### NIZAM'S GUARANTEED STATE RAILWAYS OF INDIA

Announcement is made of the placing of a contract with Beyer, Peacock & Co., Ltd. of Manchester (Eng.) for five 2-8-0-type superheated locomotives, while the Vulcan Foundry, Ltd., has also been successful in securing an order for two 4-6-0-type superheated locomotives, all of which are destined for use on the Nizam's guaranteed state railways of India.

### EAST INDIAN RAILWAY PLACES BUFFER ORDER

An interesting contract has just been placed with the Sheffield firm of George Turton, Platts & Co., for 6,500 large complete buffers for use by the East Indian Railway Company. The buffers are to be constructed on the firm's new weldless forged steel principle.

### SIAMESE GOVERNMENT ORDERS GUNBOAT

Sir W. G. Armstrong, Whitworth & Co., Ltd., of Newcastle-upon-Tyne, have recently received an order from the Siamese government, for the construction of an armoured gunboat for the local river service. The length of the vessel is to be 175 feet and it is to have a displacement of about 1,000 tons.

### WAGON CONTRACT PLACED BY MADRAS AND SOUTHERN MAHRATTA RAILWAY

An important contract has just been secured by the Metropolitan Carriage, Wagon, and Finance Company of Birmingham (Eng.) for 100 covered wagons and 100 open goods wagons. These are to be constructed specially to suit the broad gauge of the Madras and Southern Mahratta Railway Co.

### YOKOHAMA GASWORKS PLACES CONTRACT

The Power Gas Corporation of Stockton-on-Tees, has recently been commissioned to supply a complete gas coal retort generator plant for the Yokohama Gas Works.



# The Greatest Civilizing Force in Eastern Asia

Japan's Heroic Efforts to Avert War by Developing Nearby Sources of Raw Material and Food for Her Rapidly Increasing Population

## The Real Mission of the South Manchuria Railway

By Geo. Bronson Rea

**FOREWARD:**—Japan is now in the market for another large reconstruction loan, this time for Y.130,000,000 to enable the municipal government of Tokyo to carry through its share of the improvements. The Imperial Hotel, we are informed, is seeking a loan, the Kobe-Osaka Electric Railway has issued debentures in London, the city of Osaka will require financial assistance, the Korean railway companies are casting their eyes abroad as the only hope of obtaining the finances for carrying through their programs, while the South Manchuria Railway is embarking on schemes which will revolutionize the steel and oil industry of the Far East. Many other important schemes are held up for lack of funds. Behind all this activity, driving the Japanese unmercifully forward is the instinct of self-preservation, the heroic struggles of a peace-loving people desperately seeking a solution to the problems of existence through development of their own resources. The Japanese have been hard hit. The earthquake wiped out in a few hours the accumulated wealth of a generation of hard work. No war that Japan might have engaged in, could have inflicted such heavy monetary losses as the two days of horror which reduced their capital city and chief port to ashes. The calamity, however, did not stop the operation of nature's laws which is piling up annually a surplus population of 700,000 new children. They must live. To live they must work. They must be fed. America and Great Britain have closed their doors to the children of Nippon. They may not own or lease land in the Philippines. They may not settle in peace and own or lease lands in any part of China. The Russians will not have them in Siberia. They are now seeking an outlet in South America and even here Brazil is threatening to pass laws that will exclude them. A few thousand may find homes in Mexico. The problem, however, remains unsolved. Japan may fight for her right

to exist. Placed in her position there is no doubt of what the Anglo-Saxon would do. Japan, however, realizes that such a desperate remedy will bring no permanent relief. She intends to work out her salvation at home by bringing all her waste lands under cultivation, by building railways that will facilitate their exploitation, by electrifying her water-powers and changing over from steam to electricity in operating her railways and industries, and in every other way possible creating new sources of wealth that will enable her to survive with a noose around her neck and the rope being hauled tighter by the jingoes of other countries who see in her magnificent efforts to save herself only the evidence that she is preparing for a war of aggression.

This is not Japanese propaganda. Few indeed are the men in Japan who realize the facts of a situation which is driving them pitilessly forward in a struggle to preserve their existence. Their deepest thinkers fail to grasp the significance of the forces operating to isolate them and compel them to live apart from the rest of the world in their own restricted habitat. There are, however, a few men in Japan who understand and these men have determined that the solution must come from within. They look to America for that sympathy and support which will enable them to surmount their difficulties. Recent events have convinced them that a full and friendly understanding between the two countries and a proper conception of the load under which they are staggering can come only through closer business relations. They are sincere. We are satisfied that once the American people fully realize what Japan is doing to preserve peace they will stand by her and relieve as far as possible any further tightening of the noose that their past mistaken diplomacy has placed around her neck. It is in this spirit that the following series of articles are written.

G. B. R.

**W**HILE the rest of China is passing through a state of political chaos, business depression and practical suspension of all new development work, it is refreshing to turn to the bailiwick of Marshal Chang Tso-lin and see the evidences of prosperity and progress brought to the three eastern provinces through the enterprise and initiative of the South Manchuria Railway Company, one of the few foreign controlled companies in China operating at a substantial profit. In the face of the most determined opposition and passive resistance on the part of the Chinese and the constant heckling of other powers, the Japanese in less than twenty years have converted this most backward of Chinese provinces into the most advanced and most prosperous. Their example has forced the Chinese into many lines of industrial activity and in many instances, this has taken the shape of joint Sino-Japanese companies, in which the nationals of both countries have subscribed to an equal share of the capital required. There are other instances where these undertakings have been made possible solely because the Japanese with their faith in the future of the country have provided the working funds in order to overcome the traditional Chinese opposition to foreign exploitation of their resources. The total amount of Japanese capital actually invested in Manchuria is roughly estimated at Y.3,000,000 of which one-half represents the investment value of the South Manchuria Railway and its properties. For the present, however, this confidence in China has not resulted in any appreciable profit, for outside of the S.M.R. the great majority

of Japanese enterprises in Manchuria are being operated at a loss or at a profit far below the legitimate rate of interest allowed by the Japanese banks for fixed deposits. This is particularly so in the case of joint Sino-Japanese enterprises where the Chinese have contributed an equal share of the capital and enjoy corresponding equality in the appointment of directors and managers. In any fair analysis of Japan's investments in Manchuria it can be proven that far from exploiting the province, the Japanese have been the exploited. Millions have rolled into the pockets of Chinese officials for concessions that have never been worked, more millions have been invested in joint enterprises, in which the Chinese directors have made impossible the payment of dividends through overloading the payroll with relatives and salaried hangers-on. The Chinese in Manchuria, however, are prosperous; their officials are rich, Chang Tso-lin, its over-lord, has accumulated some \$30,000,000 in cash and the provincial treasury shows an annual cash balance of considerably over \$10,000,000. Much has been written about Japan's alleged exploitation of China. The other side of the story has never been told.

Manchuria, with its wonderful latent possibilities, is one of the few remaining lands of opportunity, a region in which despite all propaganda to the contrary, the principle of equal opportunity prevails for the trade and finance of all nations. That the province has gravitated under Japan's sphere of economic influence is due in part to the fact that its development has been made possible exclusively through Japanese initiative, the investment of Japanese



capital and to basic economic laws which no amount of political opposition can set aside. The fact that the territory is open for the trade of other nations is a constant reminder of the tremendous sacrifices of Japan incurred in driving out Russia after she had practically annexed and closed the province to foreign commerce. In restoring China's lost sovereignty over Manchuria, Japan provided evidence of her solicitude for the maintenance of China's integrity and a sincere desire to live on terms of amicable understanding with the nation from which she derived her culture and civilization. Manchuria to-day is an object lesson of what a public-spirited, well-organized and honestly directed corporation can accomplish in raising the living standards of the Chinese people at the same time improving their cultural status.

That Manchuria has been reclaimed from the poorest economical asset of China and elevated to its present enviable industrial position is due to the ceaseless activities and never-changing policy of the South Manchuria Railway Company which although coming under the technical classification of a commercial enterprise, is in reality the greatest civilizing force in the Far East to-day. This perhaps is a bold statement that may be challenged by those who believe that the American experiment in the Philippines is entitled to this distinction. The budget, expenditures and scope of the activities of the S.M.R. are three times greater even than the American administration in the Philippines and the ultimate working out of its mission will have a more far-reaching effect on the future of mankind than the widely advertised altruistic Philippine policy of the United States. In support of this statement it is only necessary to invite attention to the fact that last year the total revenues of the S.M.R. amounted to Y.185,000,000 as compared with the government of Korea's ordinary budget of Y.101,000,000, that of Formosa about Y.100,000,000 and that of the Philippines of Y.65,000,000. The revenues of Siam and Indo-China are about the same, Y.62,000,000 for the former and some sixty odd million for the latter. The only colonial government in the Far East which enjoys revenues exceeding those of the S.M.R. is that of the Dutch in Netherlands East Indies, where in 1923 the total receipts are estimated at 366,000,000 guilders or roughly Y.300,000,000. The budget of the S.M.R. in addition to making up the annual deficit for the administration of the Kwantung leased territory which supports many schools and two colleges, also maintains all the schools in the railway zone (nearly 100) out of its appropriation of Y.10,000,000 for administrative expenses, a heavy and increasing burden entirely out of proportion to the railway receipts.

The fundamental policy guiding this tremendous civilizing and progressive force has remained unchanged through successive administrations, the main objective being to develop the resources of the territory served and create for China, Japan and the world at large a new storehouse of much needed raw materials, at the same time originating traffic for the railway. To accomplish this laudable end, the annual profits over a legitimate ten per cent. for the shareholders have been reinvested in establishing new industries and developing new sources of wealth. Important private Japanese interests have followed this example and invested further millions in establishing new industries not only within the railway zone but in joint partnerships with the Chinese in their own territory. At all times the policy of the S.M.R. has been to encourage the idea of Sino-Japanese co-operation and has liberally employed its surplus profits in setting an example for others to follow. In the early part of last year the number of these joint companies was 87, with a combined capital of Y.178,507,000.

This is a phase of Japan's activities in Manchuria little understood by those critics who view her every move with distrust. The Japanese may have, as these critics allege, exploited Manchuria, but such activities have been offset a hundredfold by the manner in which the Japanese have been exploited by the beneficiaries of their policy. The surplus profits of the S.M.R. added to the millions poured into the country by private Japanese investors have created the industries and developed the new sources of wealth which have made possible its present prosperity. For every dollar of direct profit taken out of Manchuria by the Japanese, ten dollars have found their way into Chinese pockets. Had the S.M.R. pursued a sordid money-making policy, piling up fat dividends for its shareholders, there might be some justification in the accusation that it was exploiting Manchuria for the benefit of Japan. Facts and figures, however, prove the contrary. Instead of the Japanese reaping legitimate rewards from their investments, the profits in the main

have been distributed amongst the Chinese. Manchuria as a dividend-paying proposition for Japan is a fiction existing only in the imagination of her detractors.

In this respect Japan's mission in Manchuria resembles the philanthropic program of America in the Philippines and in other parts of China. While Americans contribute two dollars towards religious and cultural uplift work in China for every dollar they take out in legitimate trade profits, the Japanese have contributed fifty yen towards improving the material well-being of the Chinese in Manchuria for every yen returned on their investments. It is a matter of opinion which policy is doing the most to elevate the status of the Chinese. Both nations seem willing to wait for the future to bring its rewards, the difference being that the recipient of Japan's commercial altruism at least has the immediate satisfaction of possessing a fat pocket book and an overflowing rice bowl while America's beneficiaries are consoled by the hope that some day in the distant future they or their children will also be well fed and profitably employed. On the other hand, Japan's philanthropy in Manchuria has brought hundreds of millions of dollars in orders to American manufacturers and we have no just cause to condemn a policy which has such a profitable bearing on our trade with this country.

As long as Japan adheres to her present program in Manchuria other countries will benefit enormously from the prosperity of the Chinese. Japan is and must always remain a creator of wealth, pushed forward by forces she may not resist without peril to her very existence. In this instance Japan has the satisfaction of having added to her near-by sources of raw materials and food supplies and of having consolidated her strategic position in the one quarter through which her national security was constantly menaced. Although much of the fruits of her labors have gone to swell the trade returns of other countries with China, Japan rests content with the indirect benefits that have accrued to her own commerce through the increased purchasing power of the Chinese and to the permanent improvements that are steadily increasing the volume of traffic over the S.M.R. and appreciating the value of its properties and other investments.

To quote the words of Mr. H. Porter, the British consul-general at Mukden, at a dinner recently tendered to Mr. Yasuhiro, president of the S.M.R. :

**"It would be hard to find anywhere in the world an enterprise combining in itself so many and such varied activities, which, nicely handled and administered by the best brains Japan has at her service, has proved an object lesson in the art of communal development and the spread of modern civilization by railway . . . To have confined the enterprise into one of mere money-making would have been to lose one of the finest opportunities ever offered for far-reaching schemes of development which, while not immediately profitable, will in the long run not fail to justify themselves and the aims of their promoters."**

In these words, the British consul-general at Mukden reveals something of the great change in the attitude of the foreign community in Manchuria towards the Japanese, a public testimonial to the great debt it owes to the spirit of fair-mindedness and consideration towards foreign interests which has always characterized the policy of the S.M.R. It is regrettable that such a public acknowledgement of the truth is not cordially endorsed by American opinion in China still influenced by a small anti-Japanese group which has arrogated to itself the right to speak on all occasions for national interests in this country. The British spirit of fair play so eloquently voiced in the above words, is a sign of changing conditions, a breaking away from the leading strings of narrow-minded and bigoted propagandists that is bearing fruit in increased orders for British materials and a corresponding decline in the volume of business with American manufacturers. That America is losing out in the competition with manufacturers of European engineering specialities in the equipment of new industrial establishments in Manchuria is traceable largely to anti-Japanese propaganda inspired by a group of Americans operating from Shanghai.

It is not the purpose of this article to describe in detail the many and varied activities of the S.M.R. as this would require a special volume. The urgent task which confronts Japan in developing this vast virgin territory as part of her pacific program to ward off the consequences of keeping her people at home and providing them with assured sources of raw materials and food is one that should merit the cordial sympathy and financial support



of other nations, especially of the one nation whose exclusion laws have driven the Japanese into this corner of the world to make their last stand for the right to exist.

Few people, even in Japan itself, have a full realization of the vital bearing on the future of Japan and world peace involved in the rapid economic development of Korea and Manchuria. Each year the menace to peace becomes intensified through the rising pressure of population in a country too small to hold it. As the halter around the neck of Japan is drawn tighter by the establishment of a huge British naval base at Singapore (now a certainty under the recent change of government in the country), by the prolongation of American rule in the Philippines, closing this natural outlet to her overflow and the stubborn resistance of the Chinese to leasing their lands in Manchuria or Mongolia for agricultural purposes, intensified by the reappearance of Russia in Northern Manchuria and Mongolia obsessed with its mission to dominate Asia, only the most strenuous efforts on the part of Japan and a corresponding recognition of her problems by other powers, can avert a catastrophe. The re-entrance of the Soviet in Northern Manchuria and its determination to make the situation more difficult for Japan is seen in the recent cancellation of the agreement entered into between the former management of the Chinese Eastern Railway and the South Manchuria Railway authorities through which products of northern Manchuria were routed for export via the port of Dairen. This measure is to be followed by a revival of the old working agreement between the C. E. R. and the Ussuri Railway to make Vladivostok the port for this region and a further freight agreement with some American steamship company that will have a monopoly of carrying the freight so diverted to foreign ports. This means a loss of nearly Yen 10,000,000 in freight receipts alone for the S. M. R. and the creation of a discriminating policy designed to injure the Japanese line and the value of Japanese investments.

If the present policies of the western powers are persisted in and there is an honorable desire to maintain peace, it can be attained only by aiding Japan to become self-contained. To accomplish anything along these lines, the necessities of life and the raw materials which will enable her people to work must be secured as rapidly as possible. Herein lies the importance of Manchuria and the great part played by the S.M.R. in working out the salvation of Japan and preserving world peace. Any attempt to interfere with or obstruct its program means a corresponding tightening of the rope around Japan's neck and the coming together of a heroic fighting people in one grand desperate struggle for self-preservation. On the other hand, the sympathy and support of other nations in carrying out the great task of redeeming the waste places of this region will do more to convince the Japanese of our friendship than anything else.

It is with the hope that this friendly co-operation will take the place of the present attitude of suspicion and opposition that we present in a superficial manner some new information about the many new engineering and development undertakings now being carried out under the auspices of the South Manchuria Railway and allied private Japanese concerns. A trip through Manchuria is an eye-opener to what might be accomplished in other parts of China under an efficient and honest government and competent industrial administration. From the moment the visitor steps ashore from the steamer at Dairen, he sees on all sides the many evidences of improvements that have already elevated Dairen to the rank of second port of China, and which bids fair as time goes on, to make it the premier port.

The first thing to attract one's attention is the handsome new landing pier with its commodious and comfortable passenger rooms and cargo handling appliances, equal if not superior to some of the more widely advertised accommodations of other ports. Facing this main pier is the handsome harbor office of steel and concrete built in a circular form and housing the many offices of the port authorities. A new addition or segment that will complete three-quarters of the building is now under erection. Down the wide streets one sees lines of electric tramcars loaded with beans and bean cakes destined for the wharves or for the many oil mills scattered around the town. This service of the Dairen tramways operated by the electricity department of the S.M.R. is of great benefit to the many manufacturing establishments of the port, transporting raw materials from the railway freight yards to the factories and the finished products to the wharves and railway. Some understanding of the importance of the manufacturing plants in Dairen are seen in the statistics which show that there are 42

factories of all kinds operating within the city limits capitalized at about Y.26,000,000, the majority of these being confined to extracting the oil from the millions of tons of soya beans transported by the railway from points further north. Scurrying around the wharves are seen several of the latest electric trucks handling cargo between the steamships and the warehouses while further away in the main railway yard the work of electrifying the freight lines is in progress.

At the coal wharf where the output of the great Fushun mines is loaded into steamers for export, the ground is being prepared for the installation of special car dumping equipment that will increase the loading capacity of the pier to 4,800 tons per hour. Work at the mines is being pushed forward to give an annual output of 8,000,000 tons, the bulk of which will be exported from Dairen. To handle this enormous tonnage the S.M.R. is considering plans for the construction of a special coal port in the vicinity of Dairen, but for the present is concentrating its activities in bringing the existing pier up to its fullest loading capacity. As a part of this huge mining, transport and shipping business, the S.M.R. intends to re-equip its lines with coal cars having a capacity of 60 tons each, in itself a big undertaking. These cars are to be dumped automatically at the wharf in connection with a loading device which will deliver the coal direct into the holds of the steamers awaiting cargo. All this wharf machinery and the shunting of trains in the terminal yard will be done with electric power, calling for a corresponding increase in the present (6,000 k.v.a.) No. 1 power house of the S.M.R. located in the terminal freight yards. The head of the electricity department of the company is now on an extended tour through America and Europe investigating new appliances applicable to this scheme. It has already been decided that the Dairen power station will be equipped with a Holbeck pulverized coal plant similar to the one now in operation at Fushun and another under course of erection at Anshan. This enables the S.M.R. to utilize, for its own purposes, its dust coal from the Fushun mines for which there is no market. Expert reports on the Fushun pulverized coal plant indicate that it is the most efficient installation of its kind in the world.

On the No. 2 wharf at Dairen the S.M.R. has just completed the erection of a cold storage plant supplied by a Danish manufacturer, the first step in the development of another great industry designed to supply Japan with fresh meats from Manchuria and Mongolia. The working out of this program will call for the building of complete trains of refrigerator cars, subsidiary cold-storage stations at the various receiving points, the installation of cold-storage facilities aboard the Japanese steamers engaged in the trade and the erection or expansion of cold-storage plants in Japan. The rapid development of this industry depends in large part on the preservation of law and order in the Mongolian border lands enabling the Mongol herdsmen to raise their cattle and sheep without fear of Hunghutze raids or the more destructive imposition of illegal taxes. Japan is turning more and more to the consumption of beef, wheat and other western foods, and with the completion of a chain of cold-storage plants and transportation facilities that will land the meat in Japan in proper condition, a profitable market will be created for the Manchurian and Mongol cattle men. The new cold-storage plant on Pier No. 2 at Dairen and the construction of special refrigerator cars for the S.M.R. marks the first steps in the development of this industry.

It is well to digress from the main theme of this article for the moment in order to emphasize the really herculean efforts Japan is making not only at home but in Korea and Manchuria to solve her population problems in a peaceful manner by developing a food supply that will help to make the empire self-contained. It is not altogether sordid commercialism or aggressive political designs concealed behind peaceful penetration as some people believe which urges Japan forward in her plans to develop Manchuria. She is not so much concerned with the principles of the "open door" in that territory as she is to diminish as far possible the greater danger to international peace that may arise from her rapidly mounting population which has no outlet and no hope of sustaining life without an independent source of food supply. It will come, therefore, as a great surprise to the outside world to learn that the S.M.R. through its agricultural experiment station at Kungchiling has succeeded in cultivating rice on a large scale in a territory which before the advent of the Japanese was given over entirely to the growing of millet, the staple food of man and beast in these regions from time immemorial. Every attempt on



the part of the Chinese to grow their favorite article of food in this cold northern climate had failed.

It did not take long for the S.M.R. agricultural station to demonstrate that rice could be profitably cultivated even in Manchuria. The Chinese, as usual, scoffed at the idea. At first, the Japanese confined their cultivation to plots located within the railway zone under their own jurisdiction. It was not long before the incredulous Chinese began to sit up and take notice. Encouraged by the Japanese, the Chinese then began to plant rice in the river-bottoms in the immediate vicinity of the railway zone and little by little as success attended their efforts, extended the area by digging irrigation canals. The results are seen in the figures. The first rice crop some years ago, was about 100,000 *koku*; last year the harvest was nearly 1,500,000 *koku* and the area under cultivation is constantly being augmented.

The prospects of a heavy cultivation of rice in Inner Mongolia along the upper reaches of the Liao River are extremely promising. One of the tributaries of the Liao (the Chingshui) has an irrigable area of over 17,000,000 *tsubo* and it is in this district that Baron Okura has established a joint enterprise with the Chinese for the cultivation of rice. Because of the singular adaptability of the Chinese to supervise this particular branch of agriculture, a typical illustration of the profitable nature of the enterprise is reported where an investment of Y.5,000 brought in a crop valued at Y.35,000. The only barrier to the successful reclamation of these vast areas of waste land is the provincial law which prohibits the leasing of land to foreigners. Needless to say that although there is no discrimination, the law was specifically aimed at the Japanese, the only people interested in bringing the lands under cultivation. The situation is almost identical with that in the Philippines, where millions of acres of public land lies idle while laws have been enacted to prohibit the Japanese from purchasing or leasing them. The operation of these various land laws in near-by countries is forcing the Japanese to concentrate more and more on the development of their own narrow margin of waste lands within the empire and unless there is a solution that will enable them to have an equal chance in the struggle for existence, the result can be better imagined than depicted.

The success attending Japanese agricultural activities in Manchuria is an eloquent tribute to that same enterprise and initiative which developed in fifteen years the obscure local soya bean trade to its present magnificent international proportions. The development of the rice industry in Manchuria goes hand in hand with the development of the cattle and wheat industry, all basic essentials to Japan's ability to solve her population problem by keeping her people at home and feeding them. After closing the door to the Japanese in the United States and in the Philippines, forcing them to work out their own salvation in their own way without encroaching on the sovereign rights of China, it would seem that the American people might well stand behind the Japanese financially in order that they may succeed in their peaceful efforts to survive.

Coming back to Dairen and the work of the S.M.R., it would require a special volume to describe adequately and in detail the construction program that is now being carried out for the expansion of the city and port. New blocks of residences, clean, home-like villas with all modern improvements are springing up on all sides. Building societies are following the system in vogue in the United States of buying a few squares of land, improving it, erecting homes and selling them to individuals on the installment plan, in which they are financed by the banks and the special Japanese institutions organized for such purposes. New streets are being built, sewers and water mains laid, tramway facilities extended, automatic telephones have superseded the old system, while schools, hospitals and other public edifices are seen on all sides. The tendency is to build the residential section of the city several kilometres away at Star Beach, where already the directors of the S.M.R. and many prominent business men have erected handsome villas for permanent residence. Within ten years, the whole Hoshigaura district will be transformed. The golf links will be removed to another location and this particularly choice area will become the preferred residential section. On the program is also the erection of a much larger seaside hotel in order to accommodate hundreds of guests from all parts of China, now annually turned away for lack of rooms.

The Dairen hospital of the S.M.R. when completed, will rank as the largest and best equipped in Asia, rivalling in the completeness

of its fittings the Rockefeller Institute at Peking. This building was fully described in the January, 1924 number of THE FAR EASTERN REVIEW. It is regrettable to learn that due to the mounting costs of this magnificent edifice (that seems to come under the head of unforeseen extras in the original contract) the S.M.R. authorities have recently cancelled the contract with the Geo. A. Fuller Company of the Orient and suspended further work.

In its immediate building program, the S.M.R. has included the erection of a magnificent terminal railway station that will also house the operating departments of the railway, now quartered at the head office. The site for this station is to be alongside the present old wooden structure, just beyond the Nippon Bridge. Another new hotel is to be erected at Mukden superceding the present Yamato hotel on the second floor of the railway station. The cost of this edifice is estimated at Y.1,300,000 and prizes were recently awarded for the best plans submitted. Work, however, will not be commenced before 1925 while the erection of the new terminal station at Dairen will be postponed until other more essential industrial undertakings have been financed.

One of the most interesting features of the S.M.R.'s building program is the reconstruction of the entire colliery town of Fushun. The old Chinese city, offices of the company and the Japanese residential town are located in a direct line with the open cut work on the main coal seam and at the rate stripping the top soil is now progressing, it will become necessary, in a few years, to raze the old town to make room for further mining operations. The edge of the new open cut is now about a half mile from the town limits. In anticipation of this difficulty, the S.M.R. authorities some time ago selected a new site far removed from any present or future coal mining operations, located on the hills overlooking the Hun River. Here, a new town was laid out with wide streets, a spacious park and several playgrounds, sewer, water and central heating systems and other essential public utilities. Over one hundred new residences and apartments for the staff and workers have already been erected. These villas for the employees are probably the finest of their kind to be found in China, reminding the visitor of the southern California type of architecture. Outwardly, these houses follow the very best style of western architecture, though the interiors are designed to conform to the Japanese idea of comfort.

The S.M.R. authorities explain their lavishness in this matter of housing by the simple fact that it is the only way they can induce departmental heads, engineers, clerks and skilled workmen to leave their homes in Japan and settle down permanently in Manchuria. In order to get good men on the job and keep them contented it is necessary to provide good houses, the best of schools for their children, clubs, recreation grounds, libraries and the other cultural facilities that tend to make life agreeable in a foreign country. In other words, the S.M.R. finds it as difficult in Manchuria to engage and retain the services of good men as Americans have found it in the Philippines. There is no ulterior motive in expending funds for what in China might otherwise be classed as luxuries. It is simply the only policy that will attract and keep the best men on the job. American firms in Shanghai have faced the same problem and had to provide the funds out of their own pockets for erection of schools, clubs and churches in order to keep their employees satisfied.

In building this new colliery town, the S.M.R. is concerned only with properly housing and providing for the comforts of its own employees, leaving plenty of ground for the erection of private dwellings, stores, hotels, banks and other commercial edifices. Land for this purpose is leased by the S.M.R. to merchants and others attracted to the town because of its assured prosperity. In this connection, the Bank of Chosen and the Oriental Development Company are advancing building funds on the condition that the program of the S.M.R. is not modified or the complete removal of the old town unduly postponed.

For the water supply of the new town the S.M.R. has just completed at a cost of a million yen the installation of a water works, capable of supplying 400,000 cubic feet of sterilized and filtered water for house consumption and 200,000 cubic feet direct from the main reservoir for the use of the power houses. The Patterson system of filtering is used. A pumping station elevates the water to a reservoir for the supply of the higher levels. Another important public utility is the central steam heating plant connected by street piping with all the company's houses in the new residential district. This plant, the largest of its kind in China, is to be still further enlarged when the building program warrants it.



Having jumped from Dairen to Fushun it may be just as well to add a few more remarks about the development work now in progress at this place. The main features of the Fushun mines, their pits, sulphate of ammonia plant, Mond-gas producer and power house, and other technical details have all been published in past numbers of THE FAR EASTERN REVIEW and new developments will be fully described in future numbers. We only wish to touch on a few of the present improvements and give some idea of the progress being made. In the first place the Fushun Coal Mines are misnamed. Properly speaking, Fushun is a gold mine, with an inexhaustible supply of cheaply mined coal that will stand a century of extraction before the operation becomes unprofitable under present mining methods. The main coal seam 80 to 480 feet thick extending for several miles, dips at a slight angle towards the river from the outcrop on the Hun river hills and is easily mined by stripping off the top soil. This top-soil (40 feet thick) consists in the main of a strata of oil-bearing shale containing an average of seven per cent. crude oil, sufficient to supply 1,500,000 tons of oil annually for two centuries. An initial dry distillation plant that will produce 50,000 tons of oil annually is to be erected next year at a cost of Y.7,000,000 and the plans provide for its expansion to a point where it will free Japan from foreign oil importations. An article on this development appeared in the October number of THE FAR EASTERN REVIEW. The next few years will probably witness the investment of Y.50,000,000 in this enterprise alone, without counting the expenditure for tank cars, storage tanks at Fushun and Dairen and the use of tank steamers to convey the product to storage tanks in Japan. The development of this one industry and its by-products may well call for the investment of Y.100,000,000 in providing for all its ramifications.

Up to the present, the coal from the open cut mine has been screened and classified by hand, but a contract has been placed in Germany for a new Rheolaveur system coal-washing and dressing plant to be erected at the head of the cable incline which hoists the loaded cars from the open pit to the ground levels. This will enable the S.M.R. to better classify its coal for the market and save the screenings and dust for its own use in the pulverised coal installations it proposes to erect in all its main power plants.

The first of these pulverized coal plants, manufactured by the Holbeck Engineering Company of Cleveland, is now in successful operation at the No. 3 power house at Fushun which furnishes current for the long-distance power transmission line to Mukden and Liaoyang. This pulverized coal plant is being duplicated at the power house attached to the Anshan Iron and Steel Works and another is to be erected in connection with the power house at Dairen. Experiments in burning pulverized coal on the Formosan government railways have been carefully followed by the S.M.R. authorities and one of the possibilities of the future is the adaptation of all their locomotives to this type of fuel. The perfection of this system of utilizing the dust from their own mines will enable the S.M.R. to market their best qualities of coal and utilize profitably a product which now has no commercial value.

In this, as in many other technical matters, the S.M.R. has been the most active agent in opening up a market in China for the most advanced types of engineering installations, in which American manufacturers have, in the past, profited to a greater extent than their European competitors. This quasi monopoly is, however, being gradually displaced by a wider use of European machinery and in many of the new installations the S.M.R. has gone to Germany for equipment while British manufacturers will probably obtain the contract for the oil shale distillation plant.

At some distance from the main coal workings located along the main electric railway serving the entire colliery, is a group of new buildings erected during the war by the Kuhara interests as a zinc smelter and refinery, the ore being imported from South America. The sudden ending of the war caused this fine new plant to suspend operations and finally to close down. The buildings, however, of first class construction, with their power house and chimneys still stand and have been acquired by the Suzuki interests of Kobe who will refit and remodel them as a steel works. The Suzuki company owns and operates the Kobe Steel Works and will ship a part of this equipment to Fushun and engage in the manufacture of steel from iron supplied by the S.M.R. blast furnaces at Anshan. In addition, the S.M.R. will furnish coal and electric power at reduced rates and purchase the bulk of the steel output which for some time, we understand, will be confined to castings and minor products. As it is the intention of the S.M.R. to later on engage in

the manufacture of steel on a large scale at Anshan, the Fushun works will undoubtedly be confined to turning out the more complicated castings for machinery and railway equipment parts.

The development of the Fushun coal mining lease to a point where 10,000,000 tons of coal and 500,000 tons of oil will be annually produced is the pivotal point in the S.M.R.'s plans for the development of Manchuria, as it is from this golconda that the real profits will be derived that will enable the other undertakings to be financed. Of equal importance, however, to the future of Japan and prosperity of China is the plan now under way to restore the Anshan iron mines and blast furnaces to a profitable working basis. The Anshan iron belt is estimated to hold over 300,000,000 tons of ore but this estimate is subject to considerable revision upwards or downwards after proper exploration. During the war the S.M.R. erected at this point two blast furnaces for supplying iron ore to Japan and during the period of high prices was enabled to work at a fair profit by utilizing only the higher grades of ore found in very limited quantity, the deposits being in the main of low grade non-magnetic ores averaging 40 per cent. of iron content. Last year the S.M.R. brought out a commission of American mining experts, who, after most elaborate studies on the ground submitted their report recommending amongst other things the installation of a concentrating plant and other details which would in their opinion permit of the economical mining and handling of the ore preparatory to its being fed into the blast furnaces.

Supplementing this very complete report, the S.M.R. expert and engineer at the Anshan mines (Mr. T. Umene) conducted a series of independent experiments extending over a period of three years with the gratifying result that he has perfected a furnace that will roast the hematite ores and reduce them to sixty per cent. magnetite. Without enlarging at this time on the technical features of this process it is sufficient to state that the latest type of furnace evolved as the result of Mr. Umene's experiments has conclusively proven that the low grade hematite ores can be treated economically in large quantities thus making possible the immediate exploitation of these deposits and the profitable operation of the blast furnaces. An experimental furnace of 300 tons per day capacity has been in successful operation under the watchful care of its inventor for some months and the results obtained are so satisfactory and convincing that the S.M.R. authorities have decided to erect a battery of ten of these furnaces that will give an output of 3,000 tons of reduced ore per day or roughly 1,000,000 tons per year. The preliminary work of preparing the site for this innovation in connection with the concentration plant is now in progress, covering the entire side of a hill situated in the centre of the properties.

The battery of reduction furnaces will feed the roasted ore into the supply bins that will in turn feed a concentrating plant of equal daily capacity to be erected on the opposite declivity of the same hill in order to provide the proper gravity flow from the crushers to the sintering machines. The plans for this concentrating plant with its crushers, rolls, ball mills, classifiers, magnetic separators, pulverizers and sintering machines have all been prepared and experts are now abroad submitting reports as to the best types of machinery to be purchased. The cost of the plant will approximate Y.10,000,000. In the meantime a small experimental concentrating plant has been erected and in use for some time in order to demonstrate in actual practice that the system will succeed. This experimental plant alone cost about Y.1,000,000.

Side by side with this development goes the further expenditures for developing the widely scattered Anshan iron deposits. This covers a wide range of engineering, including the construction of miles of standard gauge railway, light railway, mine cars, diamond drilling outfits for exploration work, air compressors, drill steel, machine shops, steam shovels and excavators, new water supply and the other details which go to make up the complete equipment of a modern mining enterprise. If pig iron can be produced within the present estimates the S.M.R. authorities will leave this problem behind them as a finished job and begin the erection of a steel works and rolling mill whose capacity will depend upon the requirements of the market. It is not difficult to look ahead and foresee the day in the not distant future when the industrial requirements of Manchuria, Eastern Siberia and other parts of China will be able to consume the major part of the output of such a plant. At all events the S.M.R. authorities are once more hopeful and face the future with a greater degree of security now that the problem of what to do with their Anshan properties has been so happily solved.



# Ties that Bind

## A Wide Field for Profitable Co-operation with Japan

**T**HE report comes from New York that interests representing the Imperial Hotel of Tokyo have approached bankers there concerning the prospects of obtaining a loan of approximately \$3,500,000. The possibilities surrounding such a loan created considerable comment in financial circles as such a credit would be unique in that it would be the first of its sort ever floated in New York. Bond houses emphasized the possible risk in floating an issue secured by real estate in a country subjected to earthquakes to which the representatives of the Imperial Hotel answered that the hotel was of special construction designed to withstand seismic disturbances and was fully tested in the great quake of last year. The proceeds of the desired loan will be employed to refund an obligation of \$2,000,000 now outstanding and the remainder to enlarge the hotel's capacity from 265 to 1,000 rooms.

### Backing American Methods

There would seem to be every good reason why such a loan should not only be profitable but sound business on the part of American investors. In the first place it will show that we have confidence in our own methods of construction and encourage the Japanese in their present tendency to adopt American standards. The Imperial Hotel stood well the terrible test of September 1 of last year and those who lived within its walls through the subsequent severe shakes and almost continuous tremors have confidence that the building is the safest place in Tokyo during an earthquake. The Imperial Hotel enjoys the distinction of being the only home for foreigners in the capital. It is always full and in the tourist season people are turned away. For many years it will retain its place as the premier hotel of Japan.

The failure of such a loan at this juncture would have far reaching consequences on the future of American building methods in a country passing through the process of reconstructing itself along modern lines. Aside altogether from the reconstruction of Tokyo, the pressure of population in Japanese cities is compelling a revolution in building methods and whereas in the past Japanese houses were strung out horizontally, present conditions demand that they be built as far as possible of several stories. Needless to state if Japan is to extend vertically, the houses in the main will be of earthquake-proof steel and concrete construction and the Japanese will turn to that country for materials that has demonstrated its superiority in this class of construction. To reject the opportunity of backing our methods with a loan is to send the Japanese elsewhere for their structural materials and building specialties.

### Transformation of Osaka

It is not alone in Tokyo and Yokohama that reconstruction is taking place. There are other large cities of Japan undergoing a transformation forced upon them by the march of progress and the pressure of increasing population, Osaka, the industrial centre of Japan, is a case in point. By the incorporation of adjacent villages and towns, the city of Osaka will have an area of sixty five square miles, more than double that of Tokyo and a population of 2,000,000, fifty per cent. larger than that of the capital city. Greater Osaka will then become the greatest city in the empire. As a matter of fact Tokyo is no longer the wealthiest city of Japan that distinction having passed to Osaka. Before September of last year, Tokyo's wealth was estimated at Y.8,530,000,000, of which seventy per cent. was wiped out during the earthquake. Osaka's wealth is placed at Y.4,712,650 which places it at the head of a list of 97 municipalities. However, Tokyo's power of recuperation is seen in figures which show that in the past year it has advanced 20 per cent., which makes its present wealth about Y.3,400,000,000. For the moment, Osaka has the advantage and its merchants and municipal authorities are seeking to maintain this lead by extending the municipal limits.

The reconstruction of Osaka has been going on for some years and many new steel and concrete office buildings, warehouses and factories break the sky-line of the old one-storied Japanese city. The expansion of the original municipality into a Greater-Osaka has brought with it a corresponding extension and enlargement of public utilities. Sewers, water supply, lighting, roads, transportation, harbor facilities, sanitation, schools, parks, playgrounds and other improvements that accompany the growth of a modern city have been planned and are being built as fast as funds are provided. At the present moment, the citizens of Osaka, despairing of receiving any assistance from the imperial government for carrying out these improvements, are making up their minds to bear the expense themselves. This will probably send the municipal authorities out into the money markets of the world to obtain in part the funds that will enable their plans for a greater Osaka to be pushed forward. In such a case, the country which advances the funds, will benefit in the supply of materials.

### New Building Scheme for Tokyo

A new scheme for the reconstruction of Tokyo has been advanced by the new mayor (Mr. Zeko Nakamura), who proposes the creation of a private concern to be called the Tokyo Reconstruction Building Company capitalized at Y.20,000,000, one-quarter of which is to be paid up, and the remaining Y.15,000,000 to be subscribed within five years, the company to receive funds amounting to Y.100,000,000 from the government in five year installments at the annual interest rate of 6 per cent. The fund is left unredeemed for five years and after that it is to be refunded to the government in 15 years. The company subsidizes 60 per cent. of the total expenses required for the construction of fire-proof buildings with a total area of 800,000 *tsubo* in the fire-proof zone at Marunouchi. While the government supports the plan in principle, the municipal plan solely aims at subsidizing the construction of fire-proof buildings in Marunouchi and does not take into consideration the Y.7,000,000 which the government intends to advance to the Tokyo municipality for a commercial and industrial fund at a low interest rate.

Under the circumstances, the plan has so far failed to enlist the government sanction, but Mr. Nakamura intends to remodel it so as to suit the plans of the government authorities. Anyhow, it is practically decided that the reconstruction of the capital will be undertaken by a private corporation to be organized with municipal support, instead of being carried out directly by the Tokyo municipality.

### Loan for Tokyo Harbor

Added to this important work is the scheme for the construction of a proper harbor at Tokyo, some details of which were published in the September number of THE FAR EASTERN REVIEW. The Tokyo harbor scheme calls for the reclamation of 1,829,000 *tsubo*, of which 1,093,000 *tsubo* will be salable land that will be used as security for raising the loans required to finance the work. The amount to be raised by the city of Tokyo for this purpose is placed at Y.34,562,000 secured on the value of the reclaimed area, estimated at Y.65,580,000. According to the new program for the construction of the port, work will be started next April and extend over a period of seven years. The estimated cost is Y.35,000,000, or about Y.5,000,000 a year. The funds are to be provided by the municipality from its regular revenues, from loans, government subsidy and the proceeds from the sale of reclaimed land. Of the total area to be reclaimed (1,829,000 *tsubo*), 136,000 *tsubo* is included in the port site 600,000 *tsubo* for roads and other public uses, leaving the balance, as mentioned above, to be sold.

Amortization of the loans raised will be commenced in 1932 and completed in 1941, the total sum being Y.91,251,648, including the capital and interest to be paid. The total funds in round numbers required for the work are as follows: Municipal expendi-



tures, Y.778,000; government subsidy, Y.11,660,000: Loans, Y.34,562,000: Sale of reclaimed lands, Y.65,580,000: Total Y.112,587,000. By the end of the fiscal year 1941, the municipality is expected to have a balance to its credit over and above the cost of the work of Y.21,335,911.

### Industrial City of Tsurumi

Another equally important engineering undertaking held up for lack of ready capital is one bearing a close relation to the development of the Tokyo and Yokohama districts, involving the reclamation of enormous stretches of land between Tsurumi and Yokohama for the creation of a new industrial town site. This work has been in steady progress for some years and many large factories have already been erected on the reclaimed land. These include such important plants as those of the Asahi Glass Company. The Asano Shipbuilding Works, The Shibaura Engineering Works, the Nippon Oil Company, the Nippon Steel Pipe Company, the Mitsui Bussan Kaisha, the Rising Sun and Standard Oil installations and the Nisshin Flour Mills.

This great work which is connected with the plans for the improvements of the ports of Yokohama and Tokyo and the construction of the Tokyo-Yokohama canal, is an Asano undertaking incorporated as the Tsurumi Reclamation Company, Ltd. The reclaimed area will cover one million five hundred thousand *tsubo* (approximately 1,225 acres). Five dredges are constantly at work employing sand pumps which distribute the dredged material from the bottom of the bay to the reclaimed area. This development scheme is self-contained, having its own hydro-electric plant at Ochiai Mura with a maximum capacity of 3,500 k.w. for the needs of the industrial plants, supplemented by a contract with the Tone Hydro-Electric Company to furnish 50,000 h.p. to meet the full power demands of the area. In addition, the district is to have its own railway system operated by the Tsurumi Harbor Railway Company chartered last April.

### American-Japanese Match Combine

Another recent phase of American-Japanese co-operation is the signing of a contract on October 18 between the Nippon Match Company and the International Match Corporation of Delaware in which the American company purchased stock to the value of Y.250,000 in the Japanese concern and has underwritten its debentures to the amount of Y.900,000 to be floated in the United States. The present capital of the Nippon Match Company is Y.1,000,000 and the new contract raises it to Y.1,250,000, apart from the debentures. The International Match Corporation is a Swiss company operating with Swiss, British and American capital and registered under the laws of Delaware. It is capitalized at \$50,000,000, one of the strongest match combines in the world. This transaction marks one more step in American-Japanese co-operation, in line with similar combinations like the Mitsui-General Electric, Mitsubishi-Westinghouse, Western-Nippon Electric, Matsukata-Roosevelt, Truscon Steel and other enterprises which link together the best interests of the two countries in an industrial alliance which will contribute more towards the permanence of peace and good-will than all the treaties and protocols of the diplomats.

### Korean Hydro-Electric Field

Another article in this number of THE FAR EASTERN REVIEW on the development of Korean railways, indicates that American capital is also investigating the inducements for profitable investment held out in this country. The Korean authorities, keenly anxious to contribute their part to make the empire self-sustaining are conducting investigations that will open up their undeveloped lands to colonization and agriculture. One of the most promising fields for investment undoubtedly lies in the development and exploitation of its many water powers. A hydro-electric bureau under the department of communications is now making an exhaustive study of the power possibilities while a start has already been made in developing and utilizing the water power of the Kongo-san district. These investigations were carried on in a desultory sort of way for several years with fairly good results and in 1922 the government appropriated Y.240,000 for the establishment of a special bureau whose activities however have been somewhat crippled this year by the retrenchment program which has cut down its appropriation to Y.22,000. However, it fairly covered

the ground in the two years it was able to work unhampered by lack of funds, and by last March had completed investigations of 26 power sites capable of producing 392,474 h.p. out of the 130 places where power is available.

In addition to this work, it is carrying on investigations at over thirty places along the principal rivers to ascertain the volume and head of water at these points. One of the most interesting features of the work of this bureau which has attracted attention in America and Europe is the investigation being made for the purpose of utilizing the 30-foot rise and fall of the tide at Chemulpo for the generation of electricity. The scheme is pronounced by experts to be economically feasible. It may be some years before the Korean water resources are drawn upon for industrial purposes, but if the creation of new industrial plants continues at the present rate, it will not be long before Korea's water resources will be harnessed and made to fulfill their part in the struggle for existence that faces Japan.

### Japan's Coal-tar Chemical Industry

(Continued from page 543.)

and the evolving of new uses. The difficulty is that the most of these products are truly by-products of the very profitable industries, and consequently they are not conserved, developed, or pushed as a major product would be. The appellation "by-product" is a misnomer and should be abolished. Coal distillates should be a major product in every coal-consuming industry.

#### VALUE OF IMPORTS OF COAL-TAR PRODUCTS

[Figures represent thousands of yen]

Classes	1922		1921		1920		1919	
	Total	United States	Total	United States	Total	United States	Total	United States
Carbolic acid ...	854	18	862	407	3,634	1,501	4,337	2,381
Aniline oil ...	359	...	277	246	...	...	...	...
Aniline salt ...	299	12	88	15	489	464	41	6
Aniline dyes ...	12,965	1,688	13,004	1,783	14,895	10,113	10,629	8,041
Indigo, artificial ...	5,226	...	7,008	657	2,471	835	776	198
Other coal-tar dyes ...	687	7	460	30	547	138	91	84
All other chemical products derived from coal-tar distillates ...	1,148	45	953	351	...	...	...	...
Total ...	21,538	1,770	22,652	3,489	22,036	13,051	15,874	10,710

Note.—Japanese figures as to the participation of the United States in the trade of 1922 are not available: hence, for comparison, the export figures of United States trade with Japan as recorded in Foreign Commerce and Navigation of the United States have been used whenever classification was specific and such statistics were considered comparable.

The Soviet financial department is making its interest in the timber business very clear as a budget factor, and recently held a conference to gauge the future of the timber industry and what it may do even for the budget of the current year, not omitting the question of concessions. It was agreed that the concession holders should be required to submit to the department a statement of their financial and production programs so that the felling tax could be made a reliable basis. European Russian exports are not expected to exceed the total of the preceding year, but in the Far East the prospects are better and it is expected that the exports will show a considerable advance.

Apart from raw timber, it is interesting to learn that the production of bent wood furniture is about to begin on a serious scale in Russia. This industry had practically died out, or, to be exact, down to .5 per cent. of pre-war. The automatic extraterritorialization of many of the bent wood factories by the provisions of the peace treaties accounts largely for the practical decrease of this business as a Russian one, the bulk of the business going to Poland.

The plywood industry makes solid progress and the 9691 cubic meters made in the first half of the year would have been considerably more if the raw material had been available. The Trust is in possession of considerable orders from abroad and will execute them. The factories will be overhauled where necessary and ten factories will be at work from July 1, so we look for a large export of this item, which is one of Russia's pet industries.—*The Timberman*.



# Railways and Tramways of Korea

## A Profitable Field for American Capital

The Government's Program Calls for Building Nearly 4,000 Miles of State Railways to Which is Added Another Thousand Miles of Private Railways

THE success attending the flotation in New York of the \$10,000,000 loan to the Oriental Development Company for its enterprises in Korea, has attracted the attention of American bankers to the possibilities of that country as an investment field and it is reported that a special investigation is now being conducted in connection with the further development of private railways in that country by American capital. The excellent work of the Oriental Development Company in afforestation, reclamation, irrigation and development of agriculture in various parts of Korea is closely allied with the growth of transportation facilities and there is reason to believe that the American banking group which issued the previous loan may interest itself further in furnishing the funds for railway construction.

Korea enjoys a unique position amongst the countries of Eastern Asia, appealing strongly to the banker as a safe field for profitable investment because of the guarantees of law, order and stability in the country since it was annexed as part of the Japanese empire. With a population of 18,000,000 hardworking and peace-loving people, doubling their numbers in about thirty years, the development of the national resources becomes a problem of the first magnitude. When this is supplemented by the pressure of the population on the food supply in Japan proper, the necessity of bringing every available acre of agricultural land in the empire under cultivation is one of the most important questions that confronts the cabinet at Tokyo.

Up to a few years ago, strategic considerations played the most important part in the construction of the main Korean trunk lines. The war with Russia forced the completion of the through north and south trunk line and during the years which followed when Russia was building the Amur line and making herculean efforts to get into a position to resume the conflict, the Japanese government was faced with the burdensome task of rushing forward the construction of essential railways in Korea as part of its main line of defense. As soon, however, as these were completed and the menace of Russia became less alarming, the Korean construction program was slacked up. Regulations for private railway enterprises were promulgated and encouragement extended to private capital in order to develop the districts off the main trunk lines operated by the government. Recently, however, the Korean government has taken a renewed interest in railway development. A plan was devised in 1921 for building a net-work of 65 lines with a total length of 5,000 miles to be completed in 1927. This scheme, however, is being held up for lack of funds due to the continued depression in Japanese financial circles. This one fact will help to understand the importance attached by the Japanese and Korean governments to the rapid development of the country and the exploitation of its agricultural, and other resources in order that the empire may be self-supporting as soon as possible. The present mileage of the Korean state owned railways in operation is 1,165 miles, with 465 miles of private owned lines in operation and under construction out of a total of 1,668 under charter. Although the rapid completion of this program will depend largely on the ability to finance it, it is safe to predict that it will be carried through within a reasonable time and the little peninsula of Korea will boast as many miles of railways as the vast territory of its huge neighbor.

### State Owned Railways

The following brief resumé of the government operated lines in Korea will serve as a basis for the information about the private owned railways and tramways. The first railway in Korea was the Seoul-Chemulpo line opened to traffic in 1899. In 1901, the Seoul-Fusan (Kei-Fu) Railway Company was established and commenced the construction of the southern link of the main trunk

line from Seoul to the port of Fusan. In 1903 this company acquired the line from Seoul to Chemulpo.

In 1904 the line between Seoul and Fusan was opened to traffic, and in 1905 the line between Seoul and Shingishu and the Basan line were completed for the use of the army during the Russo-Japanese war. In 1906 the Japanese imperial government bought out the Kei-Fu Railway Company and took over the Keijo-Shingishu and the Basan lines from the department of war, and all were placed under the control of the railway superintendence bureau of the residency-general of Korea.

In 1909 they were again made part of the Japanese government railways, but, on the government-general of Korea being established in 1910, control once more changed hands. During all this time improvement and construction work was steadily carried on, and the year 1910 saw the completion of the line between Heijo and Chinnampo; in 1911 the Yalu was spanned by an iron bridge, connecting the Korean railways with the South Manchuria railway; in 1914 the line between Taiden and Moppo and that between Keijo and Gensan were completed; in 1915 part of the line between Gensan and Kwainai was opened. The last named is still under construction, but traffic is being regularly conducted between Seishin and Kwainai and Yujo and Shuotsu in its northern part and between Gensan and Kanko in its southern part.

Single control of the railways in Korea and Manchuria being considered advisable on account of their economic and communicative relations, the government-general of Korea in accordance with an imperial ordinance of the 31st of July, 1917, concluded a contract with the South Manchuria Railway Company entrusting to it the management of all the state-owned railways in Korea from the 1st of August following.

According to this contract the entire management of the state-owned railways in Korea, except the formation of plans for new construction and improvement and the provision of capital for the purpose of carrying them out, was entrusted to the South Manchuria Railway Company for twenty years, on condition that out of the net earnings the equivalent of 6 per cent. on the total amount of capital furnished by the government-general since the fiscal year 1911 be paid to government-general each year, and in the event of the profit gained falling short of that amount in any one year, the deficit to be made good out of the profits of succeeding years, while should the profit exceed the amount required, half such excess was also to go to the government-general. This arrangement was superseded by another contract signed on the 23rd of July, 1918, relieving the S.M.R. Company from paying over the half of any excess profit obtained, but requiring it to bear construction costs.

A new contract for three years, beginning with the 1922 fiscal year, was concluded in August, 1920, on the basis of the old one, with the provision that the S.M.R. Company should pay to the government-general the equivalent of 6 per cent. on the total amount of the capital advanced by it up to the end of the fiscal year 1920, and 4 per cent. on the capital furnished by it each subsequent year.

The following table gives some idea of the railway development:—

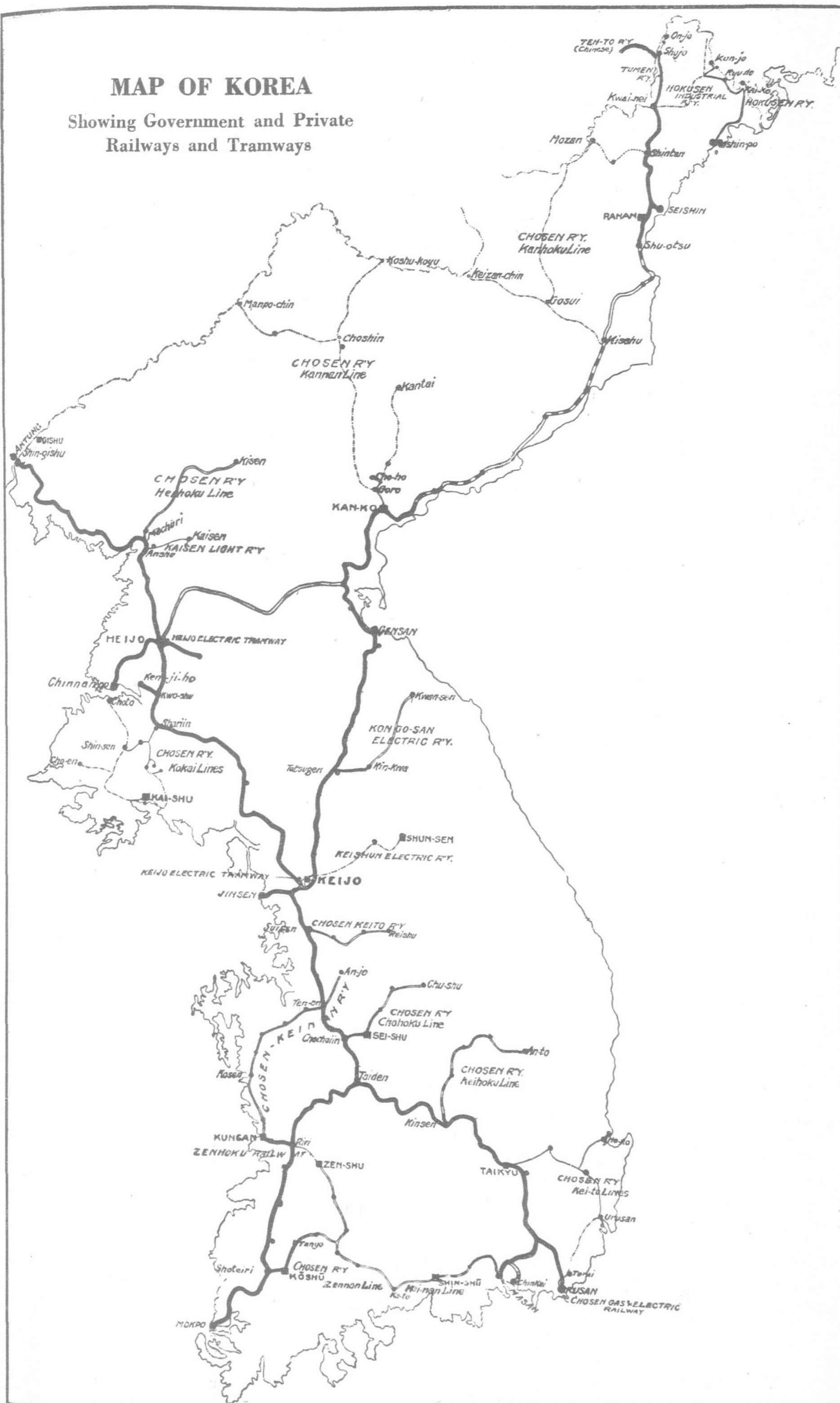
Fiscal Year	Length Miles	Passengers	Freight Tons	Receipts Yen
1921 ..	1,165.4	13,821,144	3,311,391	24,815,997
1920 ..	1,157.4	12,421,441	3,186,073	23,816,807
1919 ..	1,153.2	12,184,485	3,642,829	21,635,968
1910 ..	674.6	2,024,490	888,723	4,095,752

Though railway rates and charges had not been revised since 1912, the increase in expenditure owing to the rise in price of commodities at length required this to be done, but great care was taken to make them no higher than absolutely necessary.



## MAP OF KOREA

Showing Government and Private  
Railways and Tramways



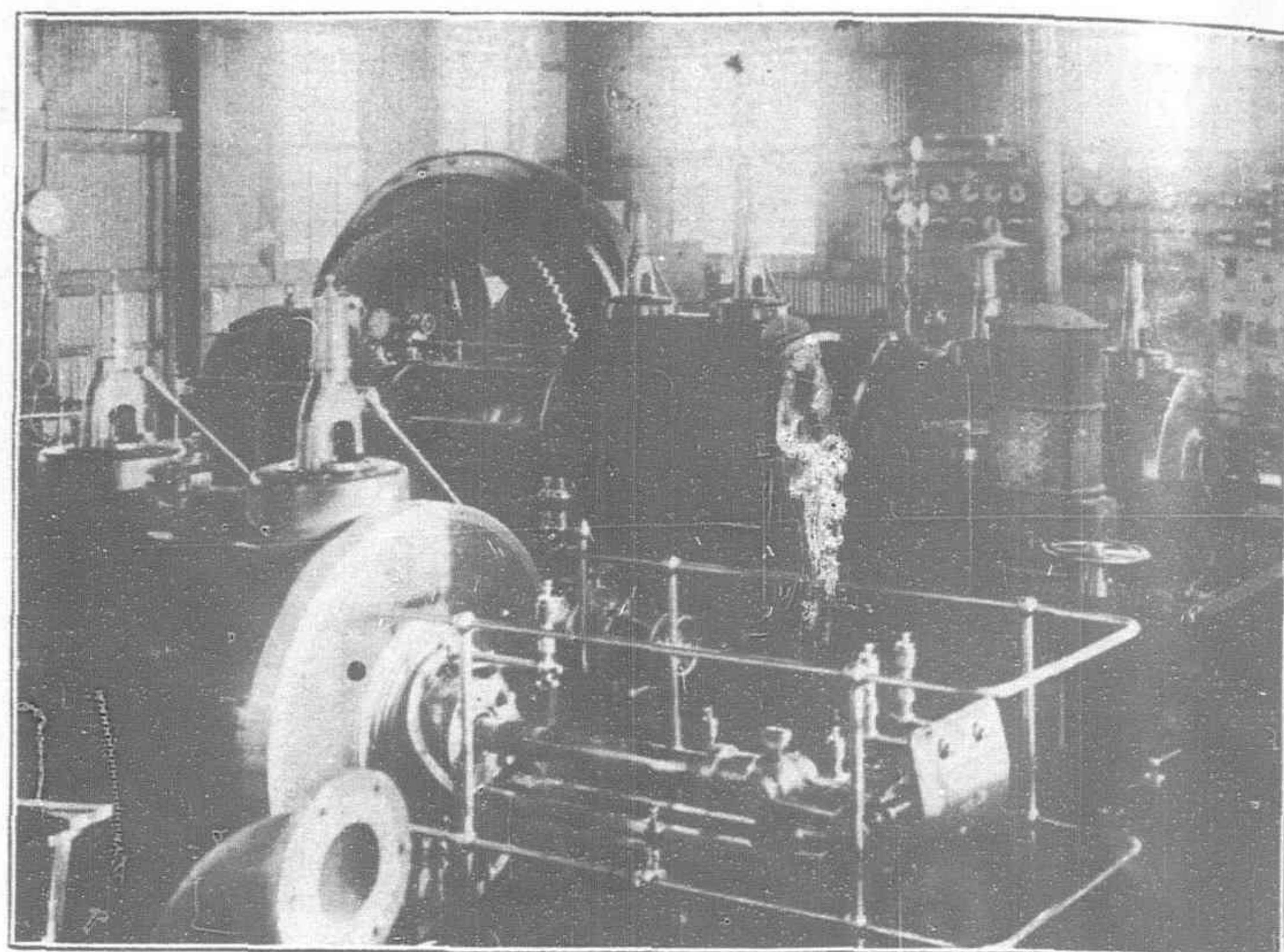
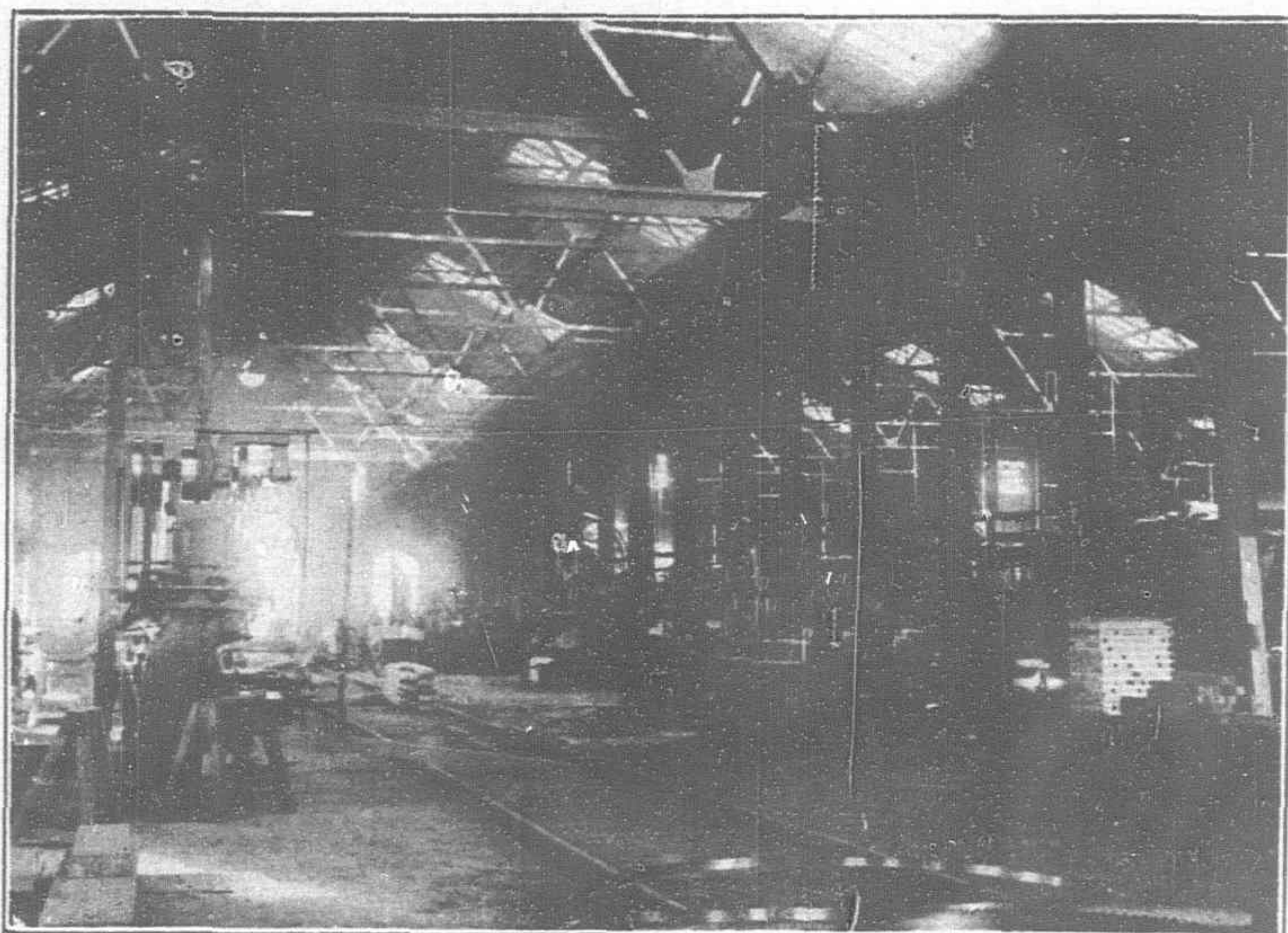
The hotel business as an adjunct to the railway business was first started at Fusan in 1912 for the convenience of foreign tourists, by making use of the upper stories of the station there, and later on, in Shingishu. In 1914, the Chosen Hotel was established on a large scale in Keijo, and branches of it at Kongozan for the convenience of sight-seers there, one at Onseiri and one at Choanji.

Warehouses were established in 1913 at Keizan and ten other places, and as time went on, were erected in other important centres. Storage yards were also prepared to cope with the prevailing congestion, and 67 points along the railways are now provided with warehouses or sheds, the number of warehouses being 58.

### New Construction

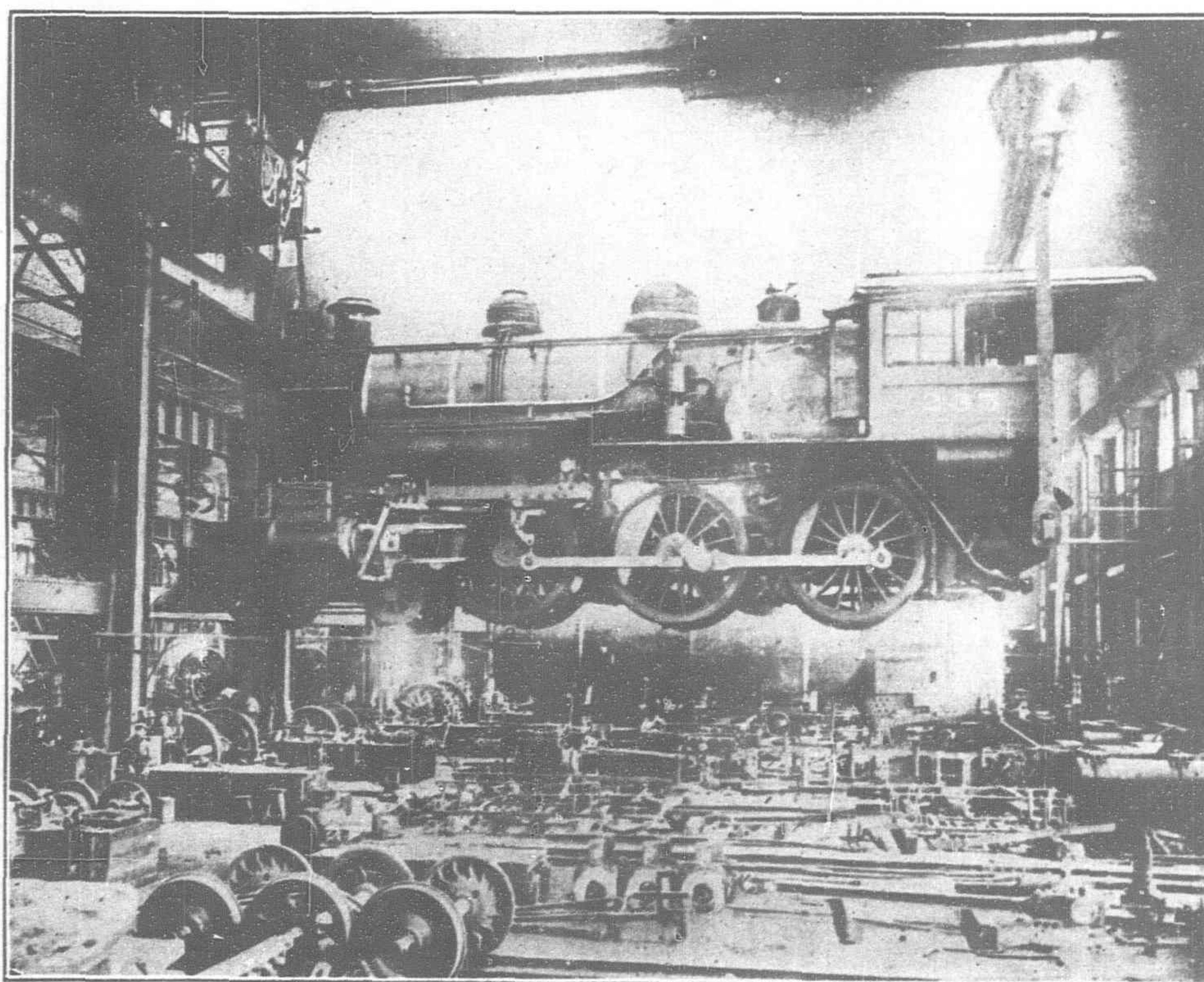
As regards new construction and improvement of existing lines, the Kei-Fu line has been continually improved since the fiscal year 1914, while the new lines Taiky-Kinsen and Taiden-Fuko were completed in the fiscal year 1916, and the Kinsen-Taiden in the fiscal year 1919, while the new line between Soryo and Fusan-chin and that near Keijo are now in the course of construction. The Kankyo line in the north-east between Gensan and Kwainai totals over 376 miles in length and has a branch line running between Yujo and Seishin. Of this the parts between Gensan and Eiko and Seishin and Kwainai were completed in 1916 and 1917 respectively, between Eiko and Kanko and Yujo and Ranan in 1919, between Ranan and Kyojo, in 1920, and between Kyoko and Shuotsu this fiscal year. In the west, the Heijo Colliery Railway bought the line between Birin and Shosorai from the Onoda Cement Company and opened it to traffic in 1918, and the Konan line started work on a track between Taiden and Moppo and between Riri and Gunsan in 1910, and opened both to business in 1914.





Of the lines now under construction or projected, the Kankyo line will be completed in the fiscal year 1927, the Chinkai line in the fiscal year 1925, and a double track between Keijo and Fusan and between Keijo and Shingishu will be laid, and new lines between Keijo and Koryo, and Gensan, Koryo and Fusan, started as soon as financial conditions will allow.

It is also planned to start construction of a line between Heijo and Kogen, 133 miles in length, at the estimated cost of Y.51,600,000 in 9 consecutive years ending in the year 1930. This line, when completed, will prove of great importance as a link

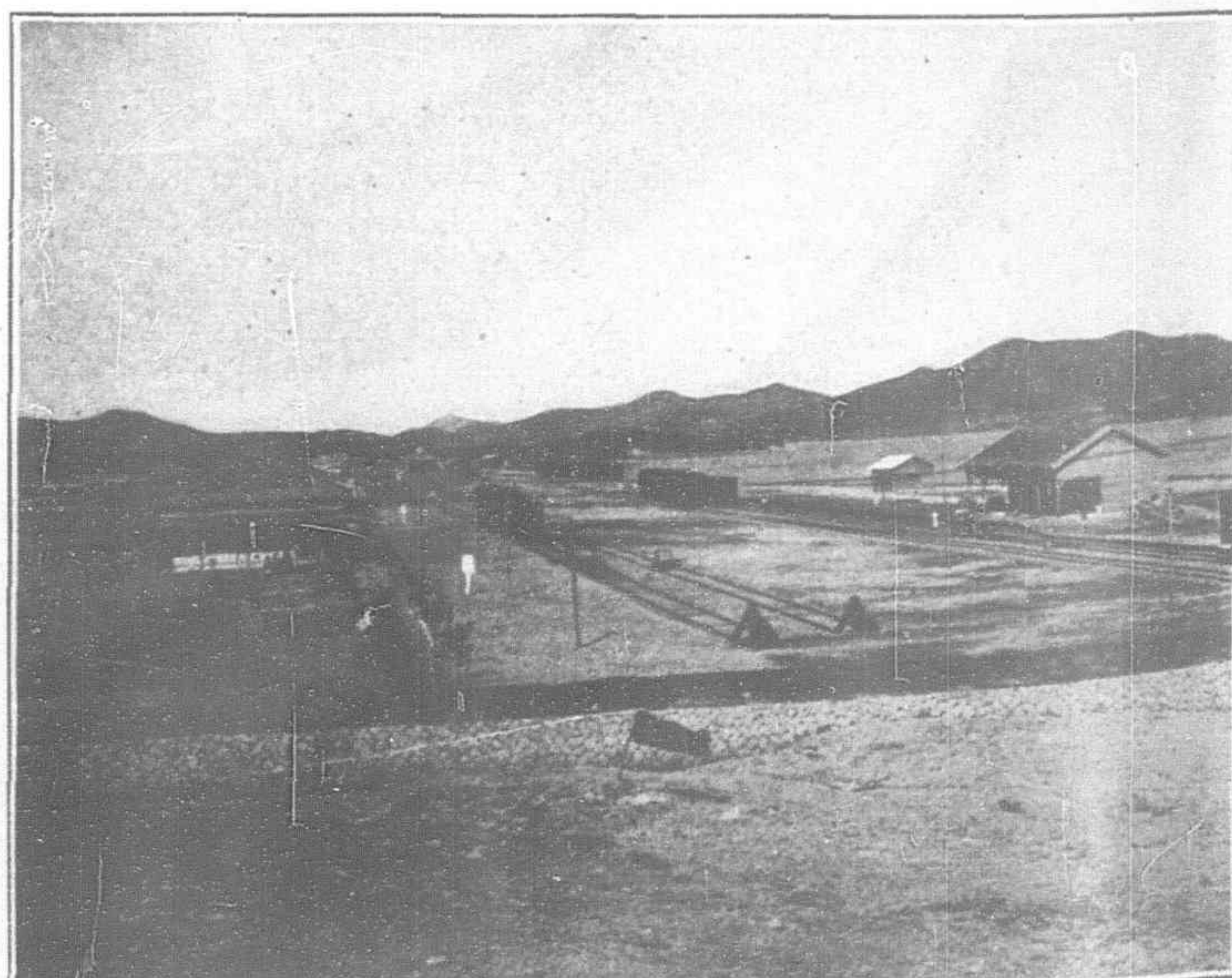
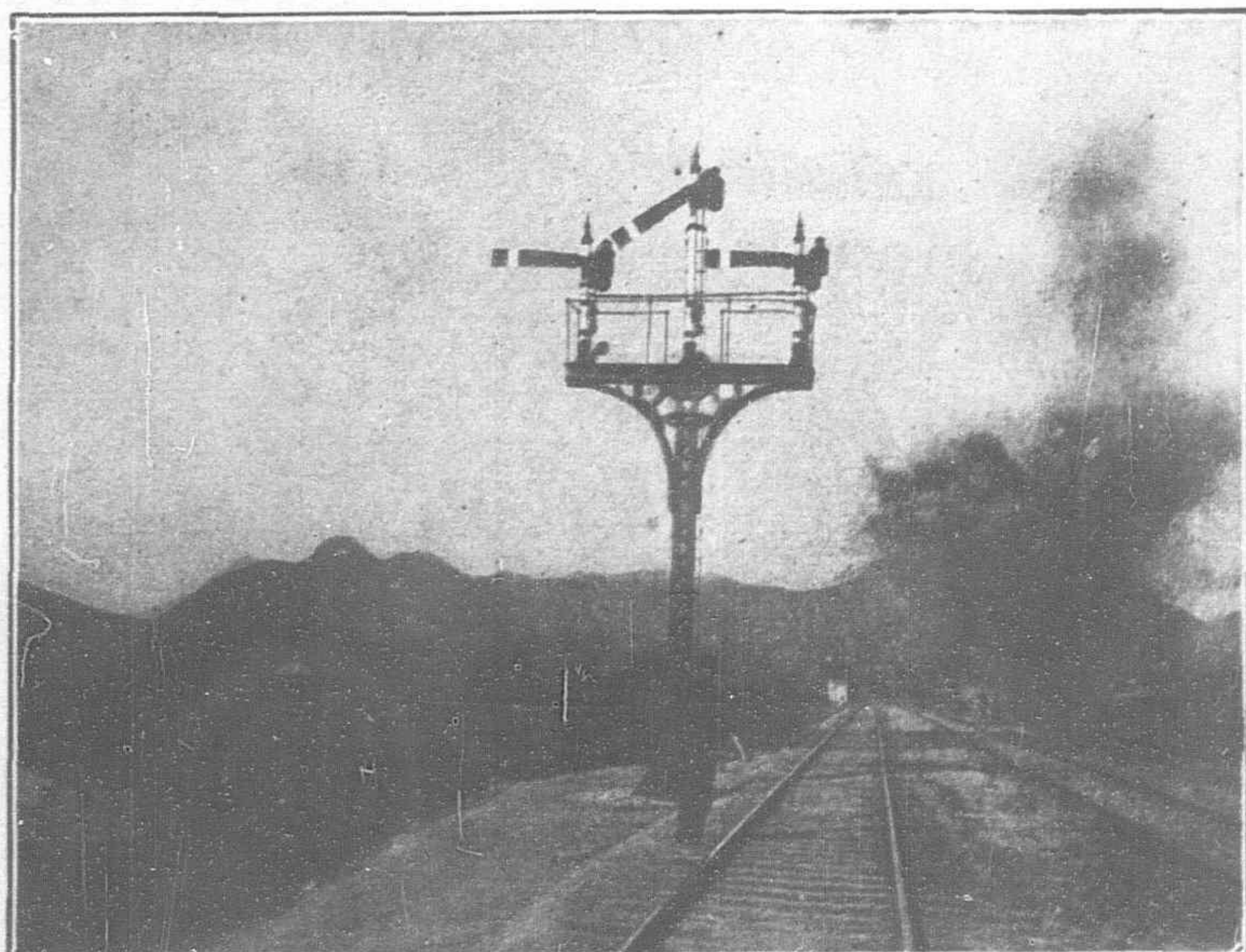


in the chain of traffic connecting South Manchuria and Japan.

### Private Railways in Korea

Many excellent transportation projects have been devised for opening up and exploiting the back districts of Korea and during the war several private companies sprang into existence and received concessions from the government but the subsequent slump and tightening of the money market caused most of them to go out of business, or curtail their activities.

At the height of the [railway boom] there were over twenty companies organized



### KOREAN GOVERNMENT RAILWAYS, OPERATED BY THE S.M.R.

Ryusan Workshops, Boiler Shop

Nandaimon Station Yard, Seoul

Erecting Shop

Engine Room, Ryusan Shops

Moppo Station



to construct lines under the government guarantee. Since then, several companies have amalgamated their interests and there are now only six private lines in operation with four companies possessing charters which have not yet perfected their construction plans.

These enterprises were the outgrowth of government regulations promulgated in 1912 for the encouragement of private railway and tramway construction, supplemented in 1914 by further provisions conceding a six per cent. subsidy to important lines in order to meet any deficiency in profit below this percentage on the paid-up capital. The subsidy was raised to seven per cent. in 1918 and to eight per cent. in September 1919. New regulations relating to the subsidies were drawn up and promulgated in 1920. As the light railway law also required revision, the Chosen private railway regulations were published in June 1920, limiting the motive power to steam and electricity and fixing the gauge as standard. These regulations also provided for an increase in capital, issue of debentures, amalgamation of companies and other important matters, so that several companies which found it difficult to finance their undertakings,

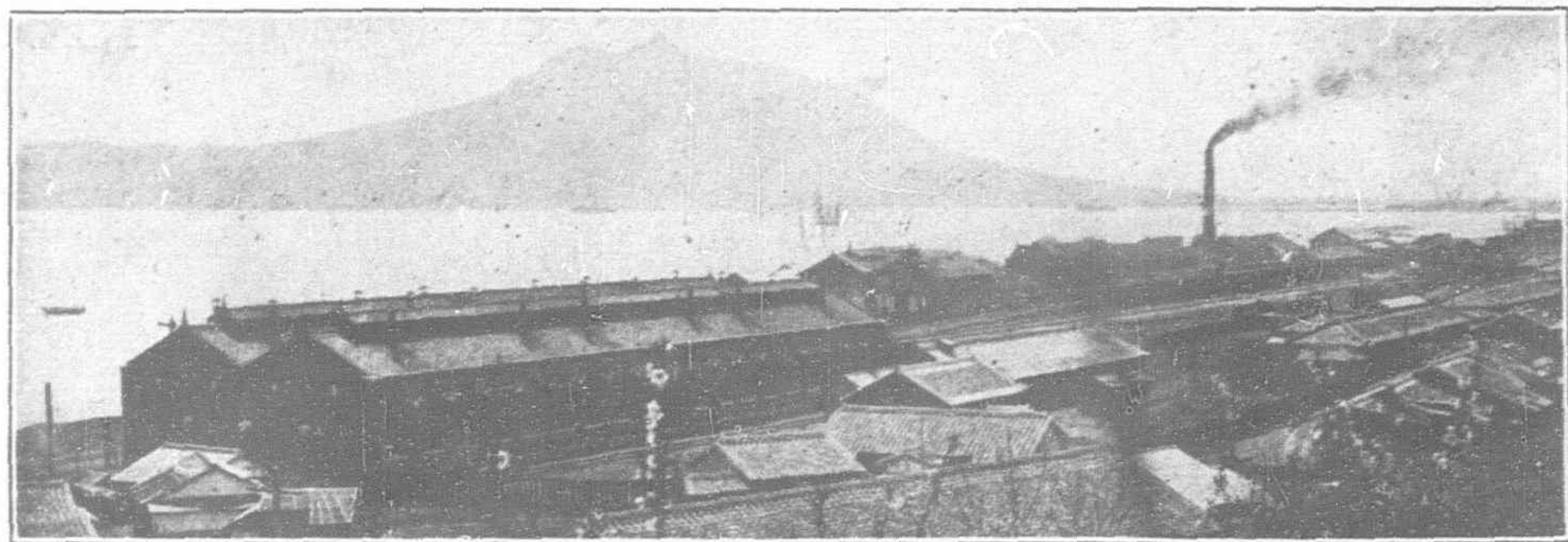
up, with loans outstanding to the amount of Y.17,611,000. The government subsidy has been extended to all these joint-stock companies to the extent that if the railway fails to make an eight per cent. profit on the paid-up capital and the loans for construction purposes, the government makes good the deficiency. The govern-

ment, however, limits this subsidy to fifteen years from the date of registration of the company's establishment or the date of registration for a loan or the day the loan was contracted.

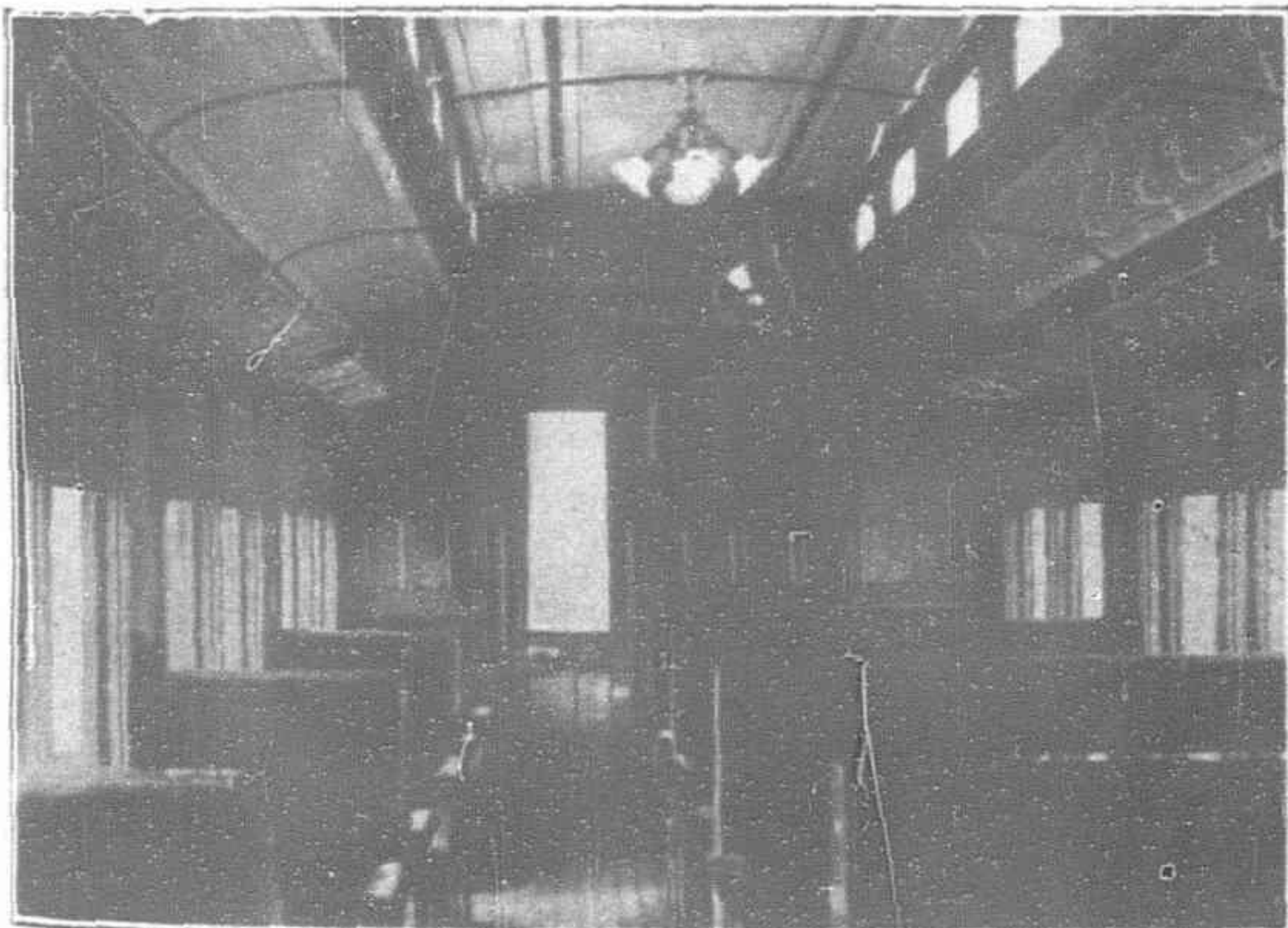
Even with these encouragements the progress of new private railway construction in Korea has been slow. The private companies,

were enabled to amalgamate their interests under one corporation.

Of the six private railways now in operation, five are owned by joint-stock companies and one by a private individual, in addition to four companies which have not as yet perfected their plans. The total length of the lines in operation owned by these companies is 346 miles with 119 miles under construction and a total of 1,668 miles under charter. The combined authorized capital of these companies is Y. 73,100,000, of which Y.29,100,000 is paid



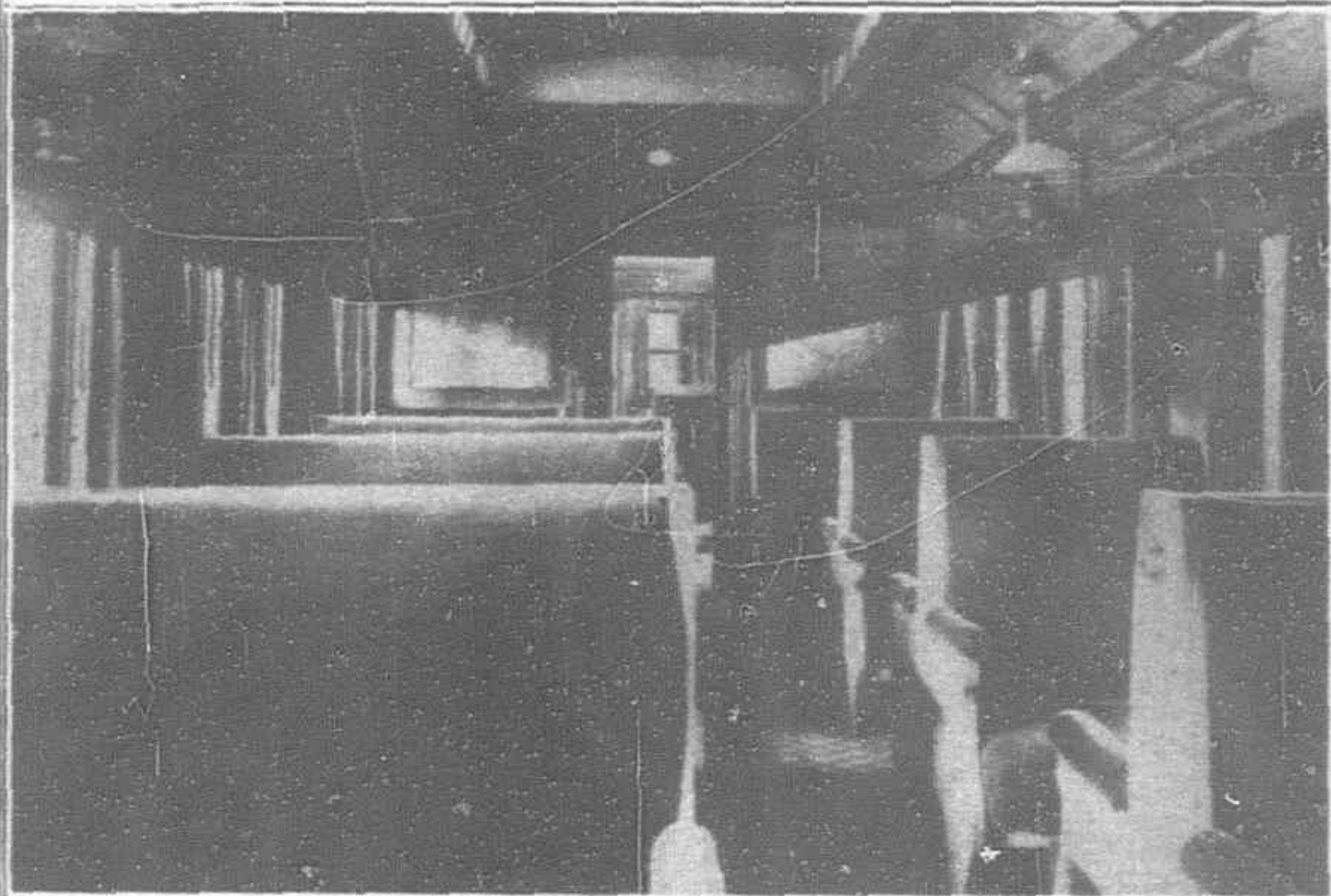
Railway Workshops at Ryuzan (top) and at Fusan (bottom)



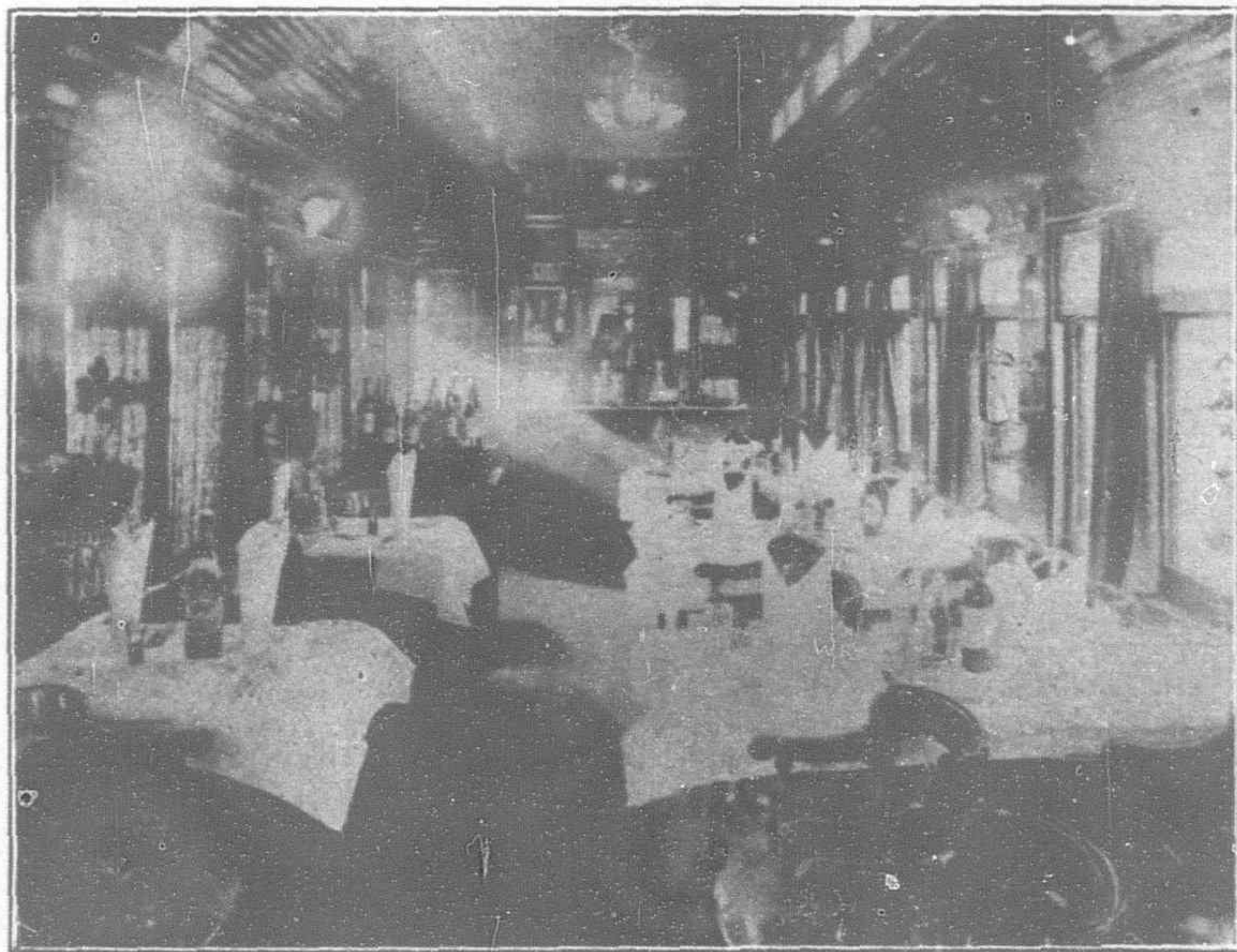
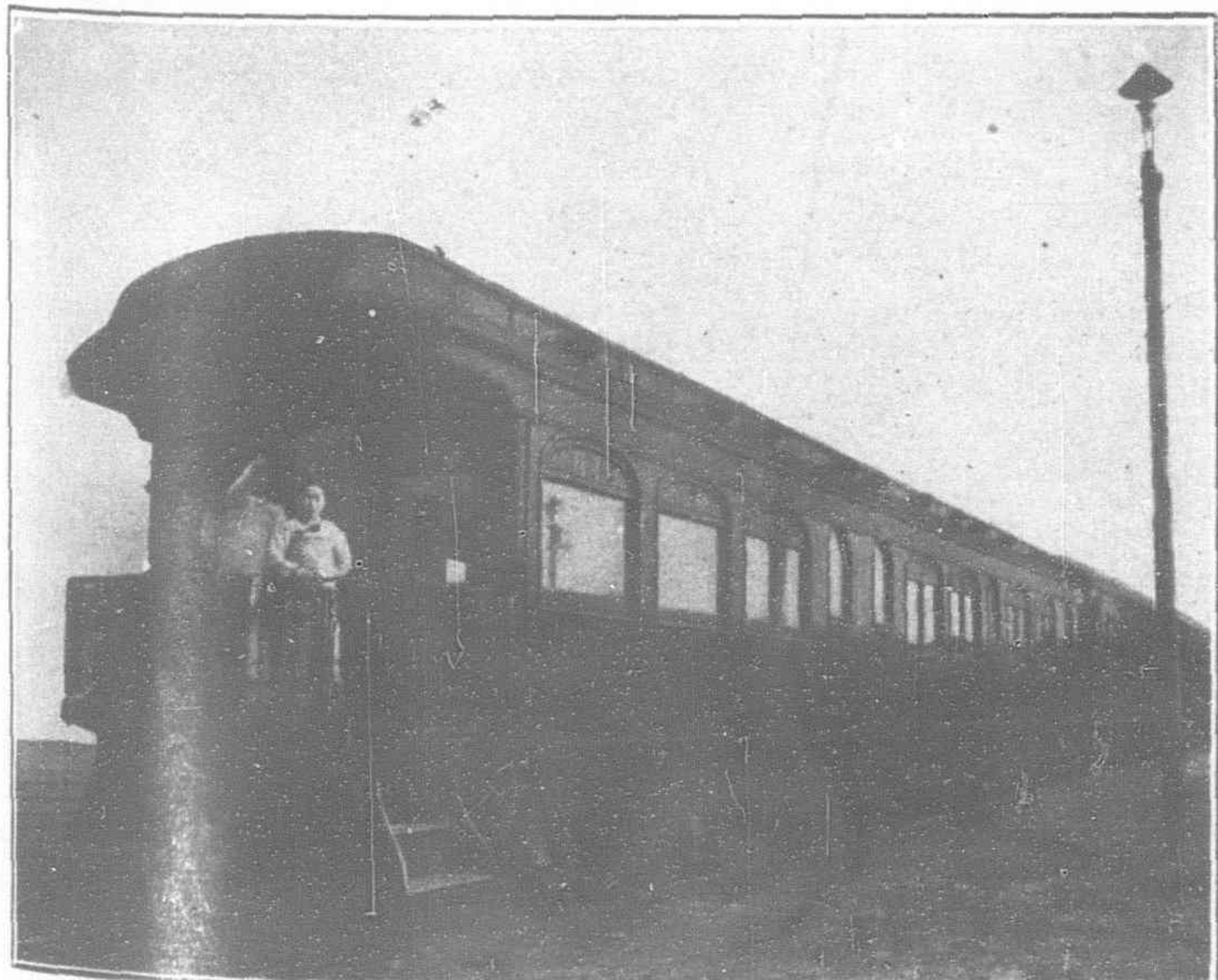
1st Class Car



Corridor of Sleeping Car

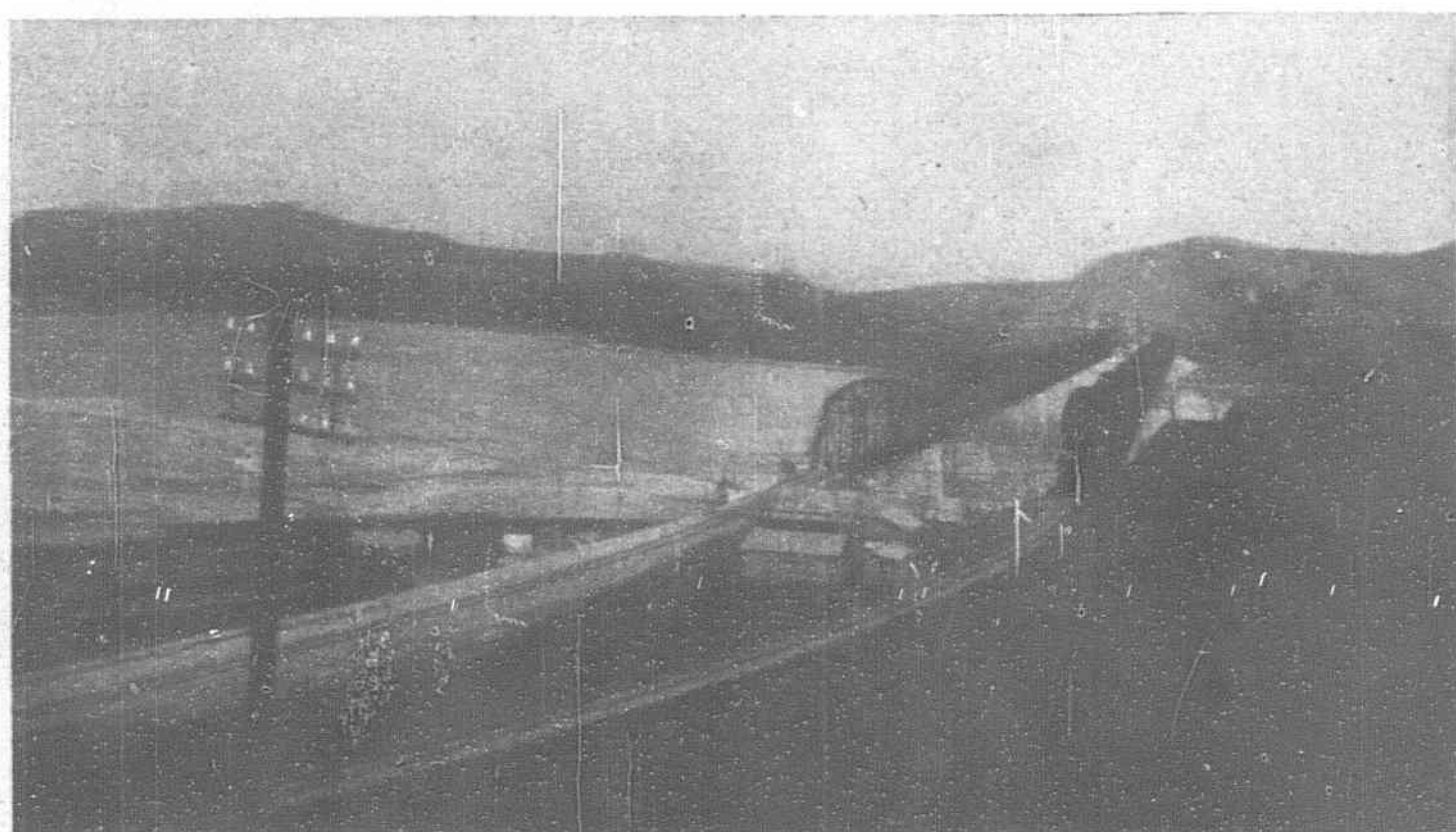


3rd Class Car



Luxurious Traveling on the S.M.R. Express through Korea: Observation and Dining Cars





Railway Bridge over the Kan River



despairing of obtaining funds in the Japanese market under present financial conditions, have placed their propositions before American bankers, while the imperial authorities and the government-general of Korea have modified their old policy and now welcome the use of loans for the completion of these much needed railways. The following summary of the private railways in Korea will give some idea of the extent and importance of their building program :—

### The Chosen Railway Co., Ltd.

This company was established in September 1923 as the result of the amalgamation of the Chosen Central Railway Company with five other companies. Its authorized capital is Y.54,500,000 of which Y.17,650,000 is paid up, with loans outstanding amounting to Y. 13,650,000. The total mileage which the company has the right to build is 1,187, covering lines which extend to every province except Keiki, Chunan, Heinan and Kogen. At present, 211 miles are in operation with 101 miles under construction. The head office of the company is at Keijo with a branch in Tokyo and sub-offices in Seishu, Kinsen, Daikiu, Masan, Koshu, Sariin, Kanko and Komosam. The various lines operated are as follows :

*The Chuhoku Line :* This standard gauge line branches off the main Korean government Keijo-Fusan railway at Chochiin and extends to Chushu via Seishu, the seat of the Chuseihoku-Do government. Its total length is 58 miles of which only the section between Chochiin and Seian (29 miles) is open for traffic.

*The Zennan Line :* This standard gauge line branches off the government Konan line at Shoteiri and terminates at Masan by way of Koshu where the government of the Zenra-nan-Do is located. The total length is 139 miles with only the 22.7 mile section between Shoteiri and Tanyo in operation.

*The Keihoku Line :* This standard gauge line branches off the main Korean government Keijo-Fusan railway at Kinsen and traversing the northern part of the Keisho-hoku-Do, terminates at Anto. The total length is 73 miles with the section between Kinsen and Eiko (38 miles) now under construction and expected to be ready for operation by the end of this year.

*The Keito Line :* The gauge of this line is 2-ft. 6-in. It starts at Taikiu on the main Keijo-Fusan government line and terminates at Hoko on the eastern coast. Another line branches off at Seigaku and extends to Torai by way of Urusan. There is also another section between Urusan and Choseiho. The total length of railway to be built by the company is 132 miles with two sections of 92 miles in operation between Seigaku and Urusan and between Daikiu and Kakusan. The business outlook for this line is very bright as it

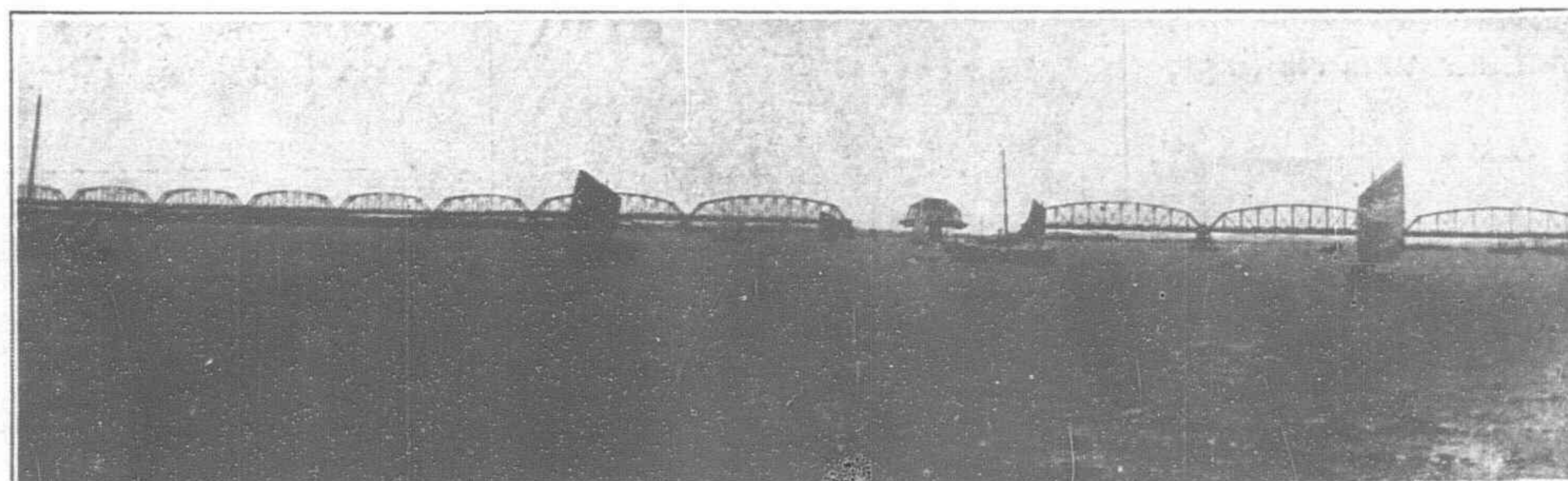
traverses a territory rich in agricultural resources with its terminus at the port of Hoko, one of the most important fishing centres on the eastern coast, assuring to it a large volume of profitable traffic in fishery products.

*The Keinan Line :* A standard gauge line starting from the terminus of the Masan

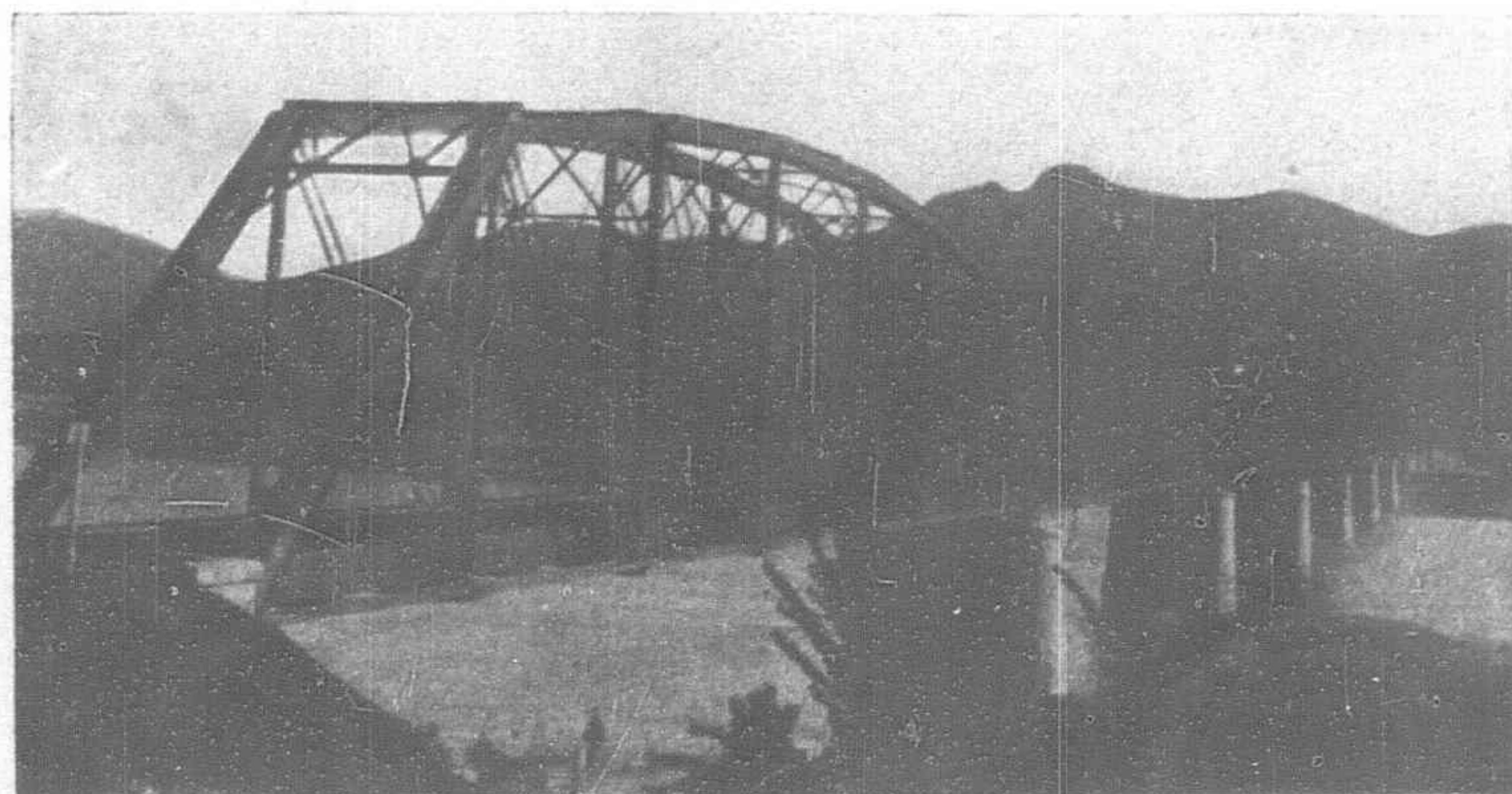
line meeting the Zennan line at Kato passing through Shinshu, the seat of the Keisho Nan-Do government. For 69 miles, the Keinan line forms a part of the main line. A section between Masan and Gunhoku (18.3 miles) is open to traffic and the section between Gunhoku and Shinshu (25 miles) will soon be completed.

*The Kokai Line :* The projected sections of this line are as follows :

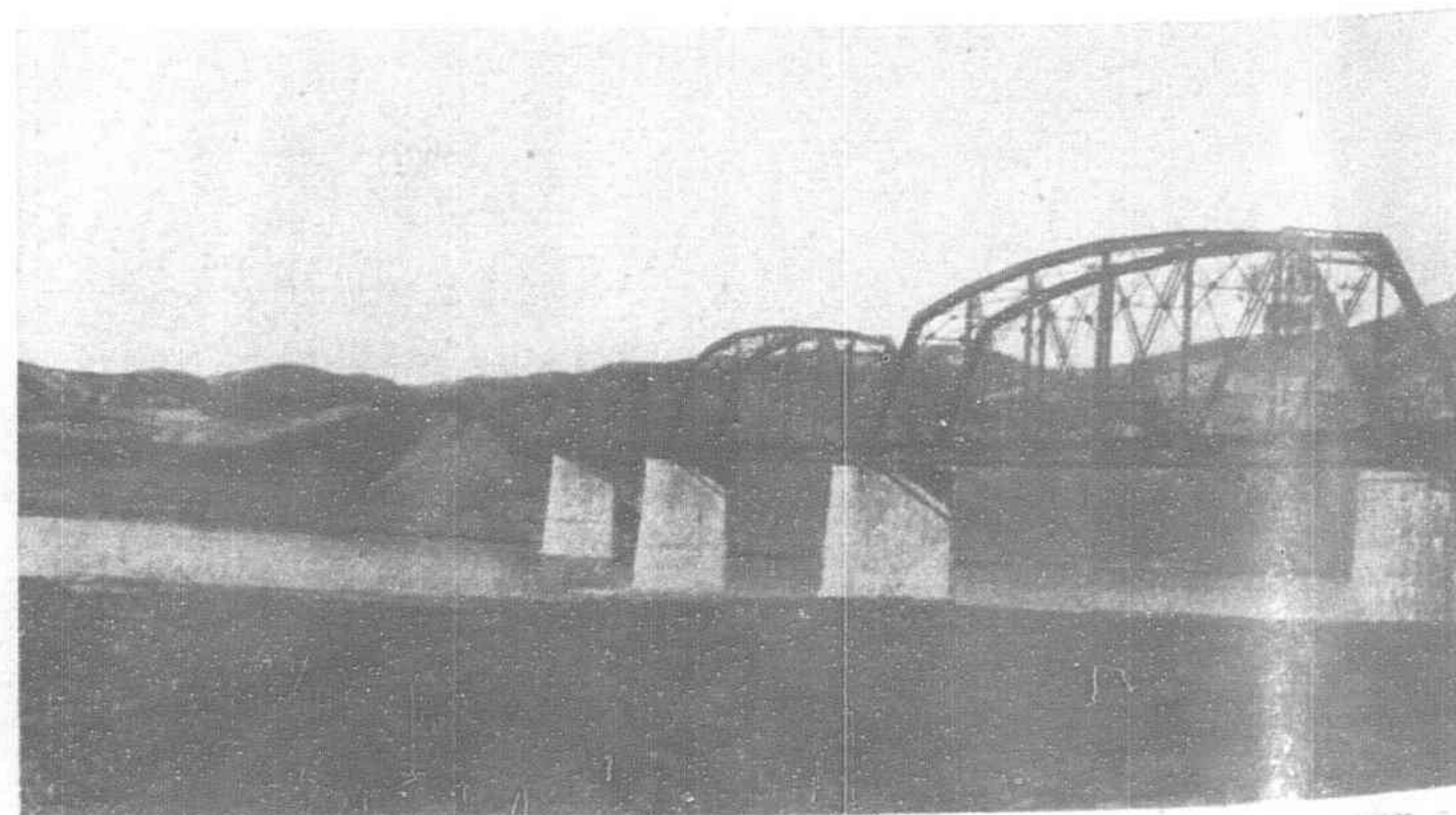
- (1) 51 miles from Sariin on the Keigi line to Choto, opposite Chinnampo.
- (2) 9.4 miles from Jokai to Ginzanmen.
- (3) 32.4 miles from Kasan on the Ginzanmen line to Kaishu, the seat of the Kokai-Do government.



Railway Bridge over the Yalu River



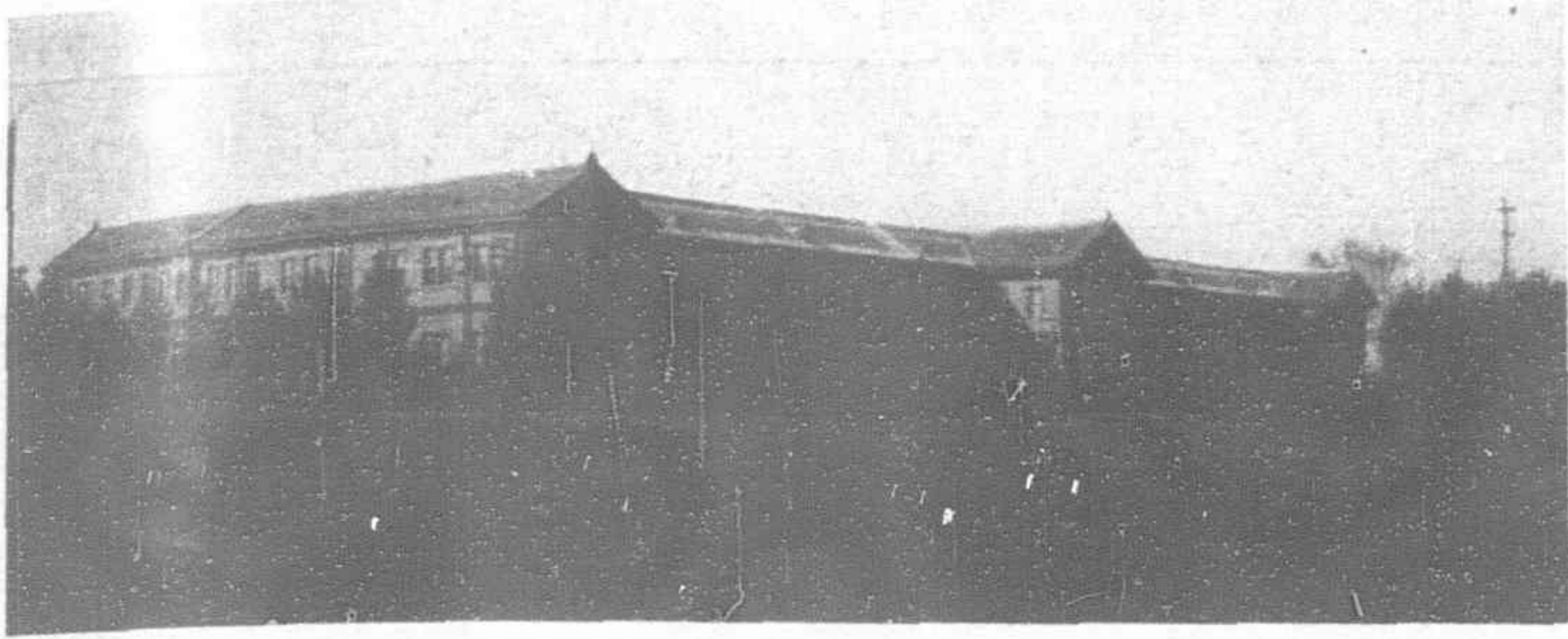
Railway Bridge over the Rakuto River



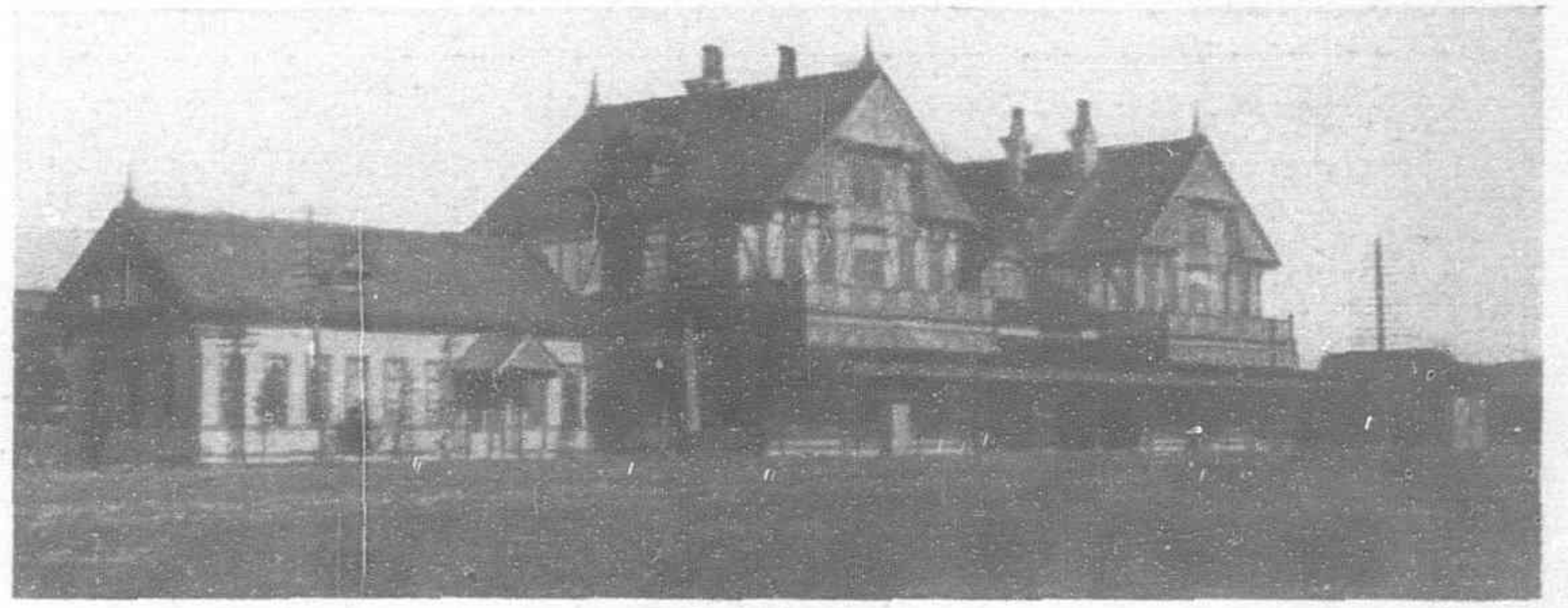
Railway Bridge over the Kin River



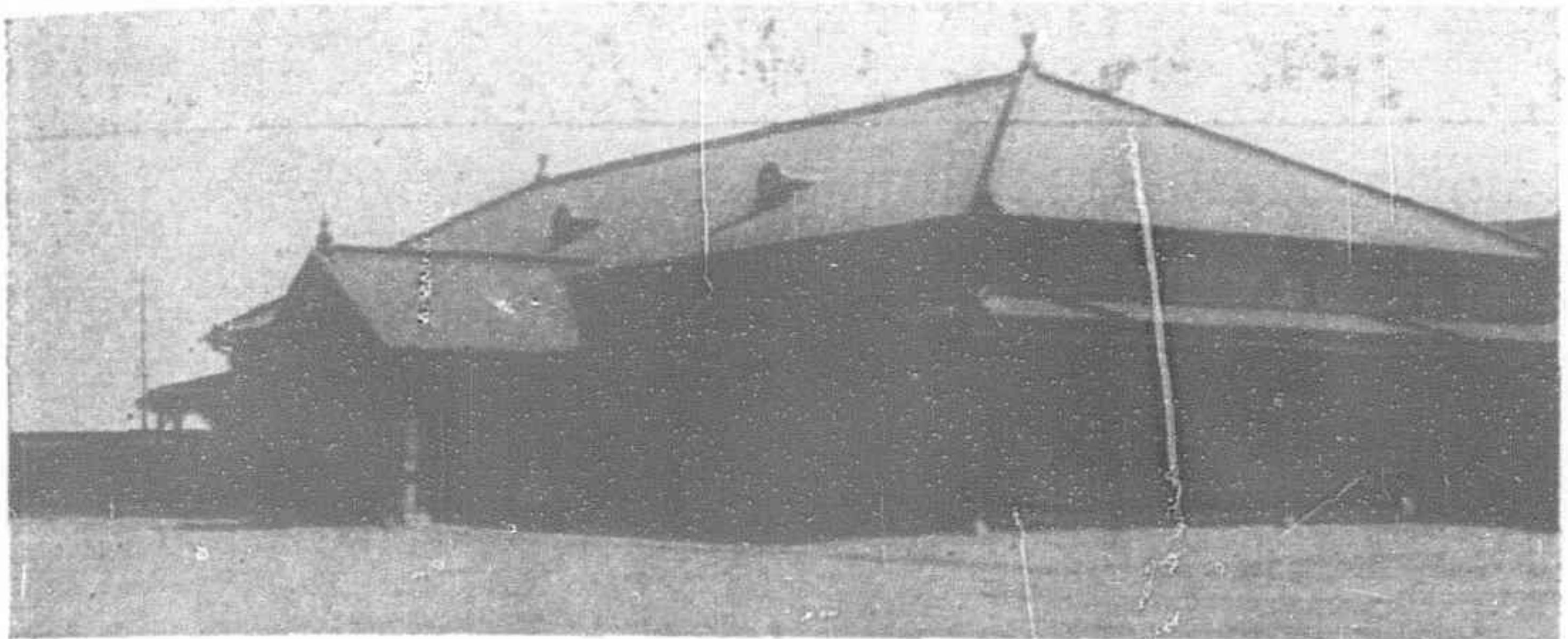
## KOREAN STATION BUILDINGS AND HOTELS OPERATED BY THE S.M.R.



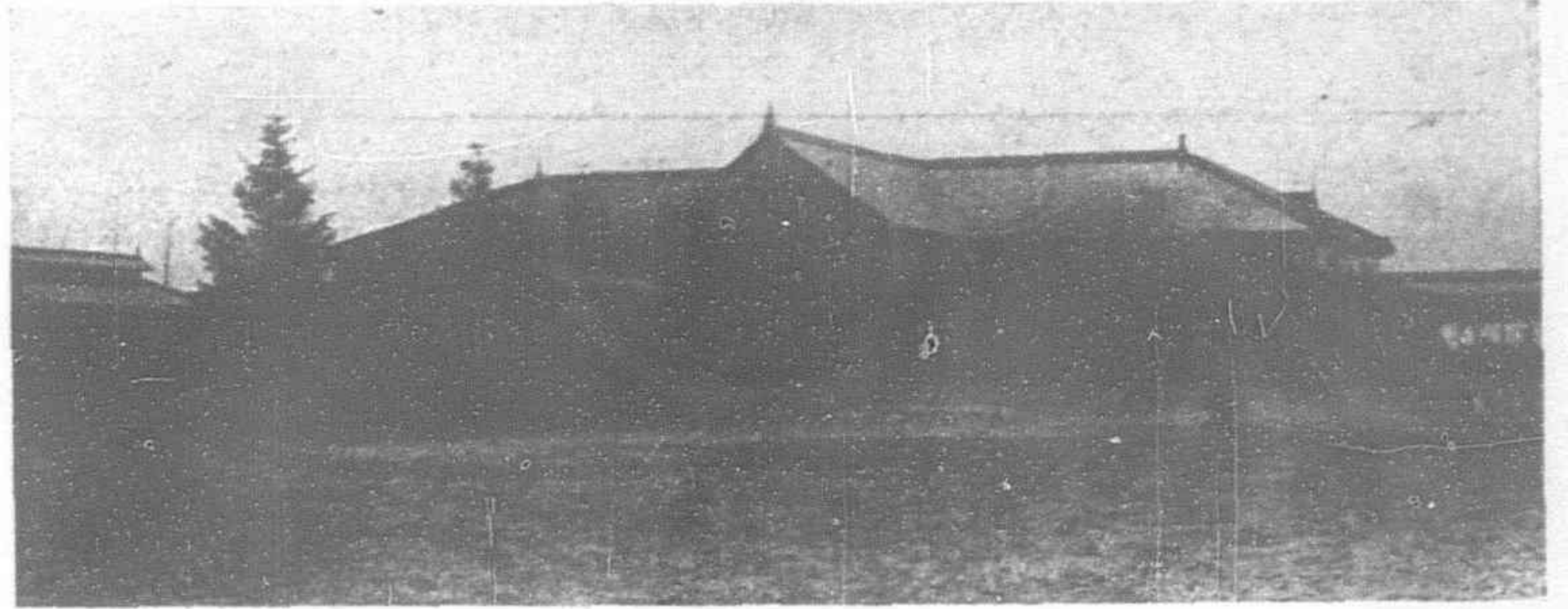
Offices of the Korean State Railways at Ryuzan, near Seoul



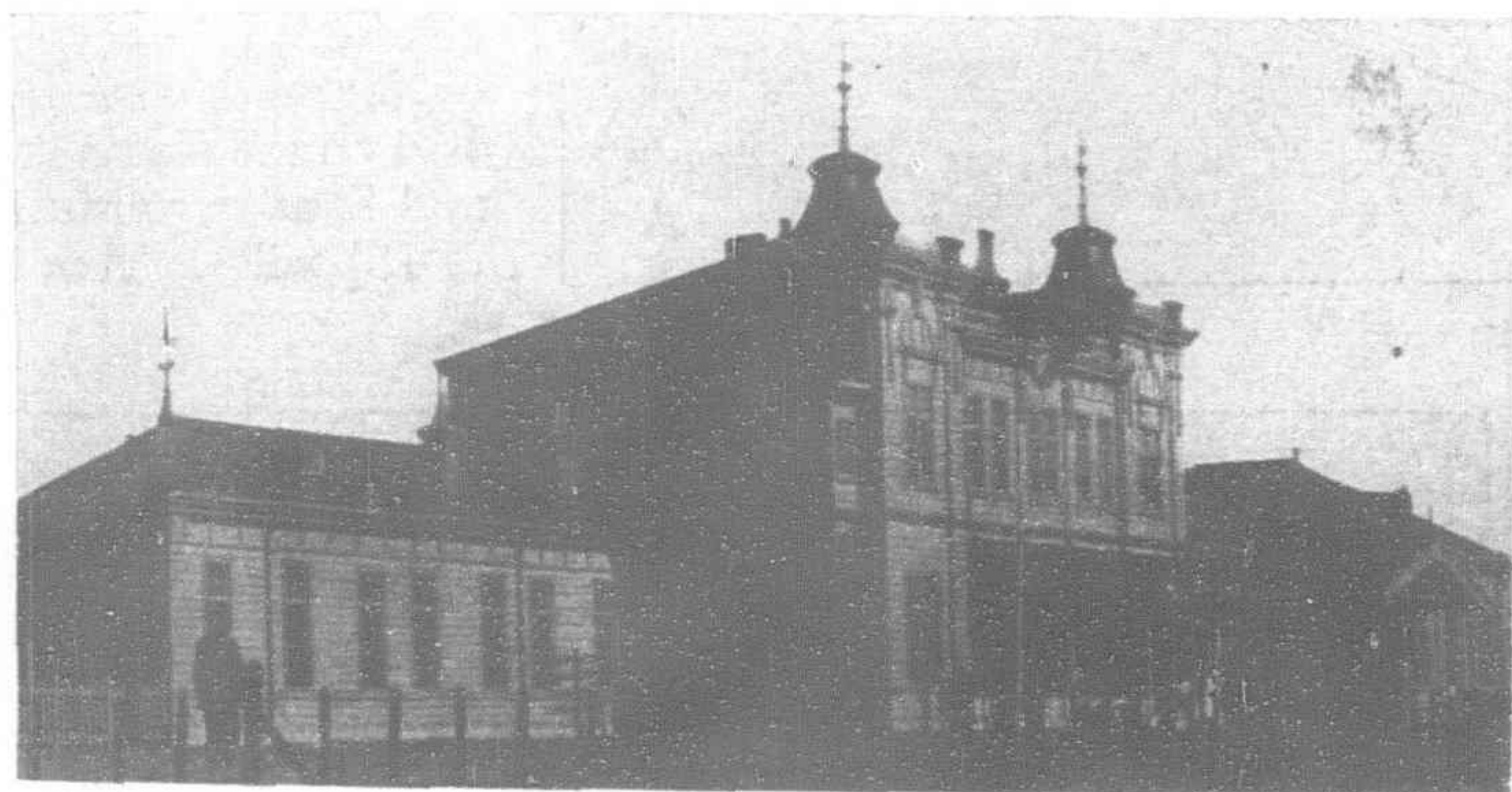
Ryuzan Station



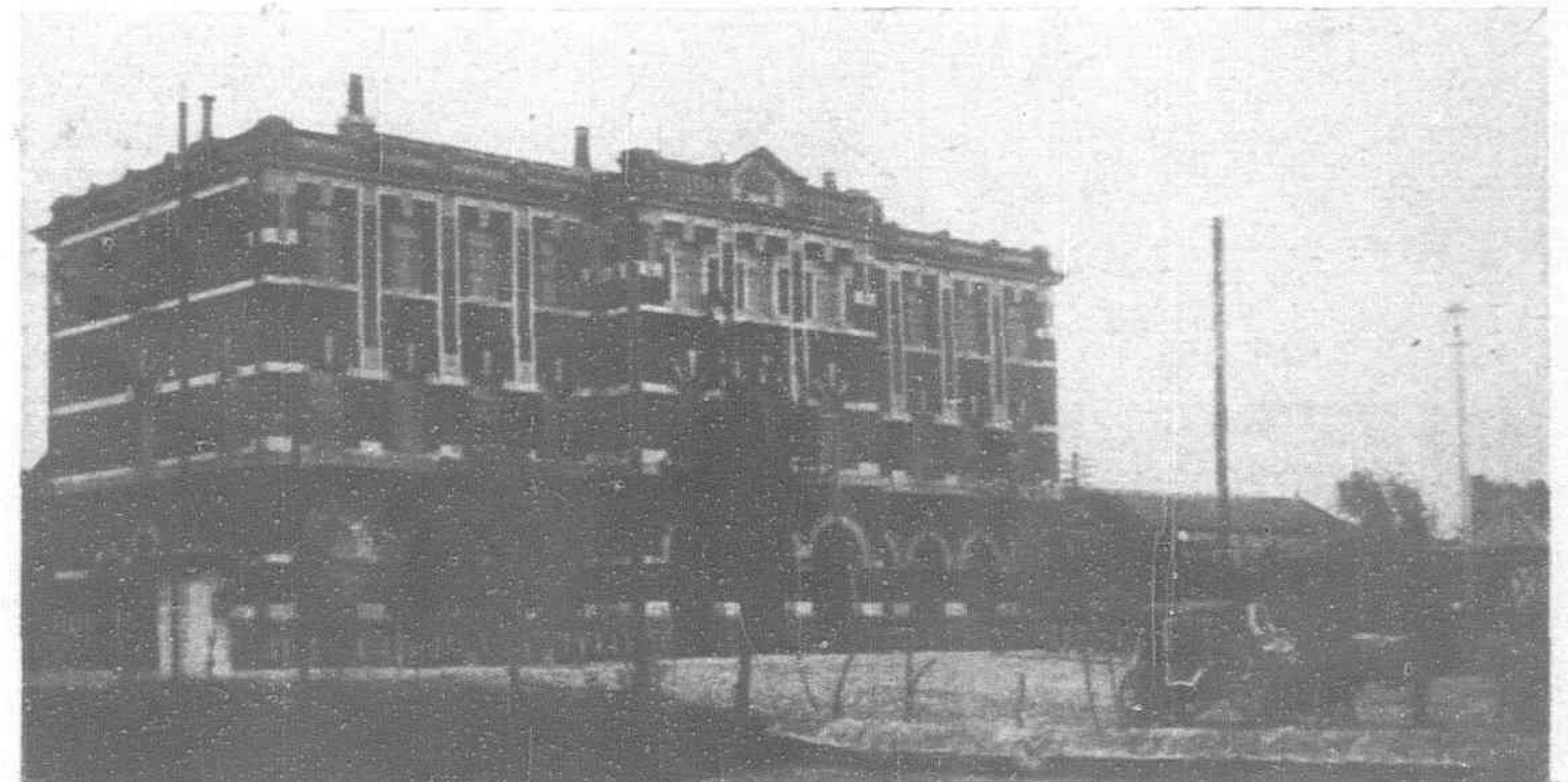
Kunsan Station



Heijo Station



Taikyu Station



Shingishu Station and Hotel

(4) 3.2 miles from Shinin to Kaseimen.

(5) 47.4 miles from Shinsen on the Choto line to Ryutoho by way of Kaishu.

(6) 18.6 miles from Rihoku to Choen.

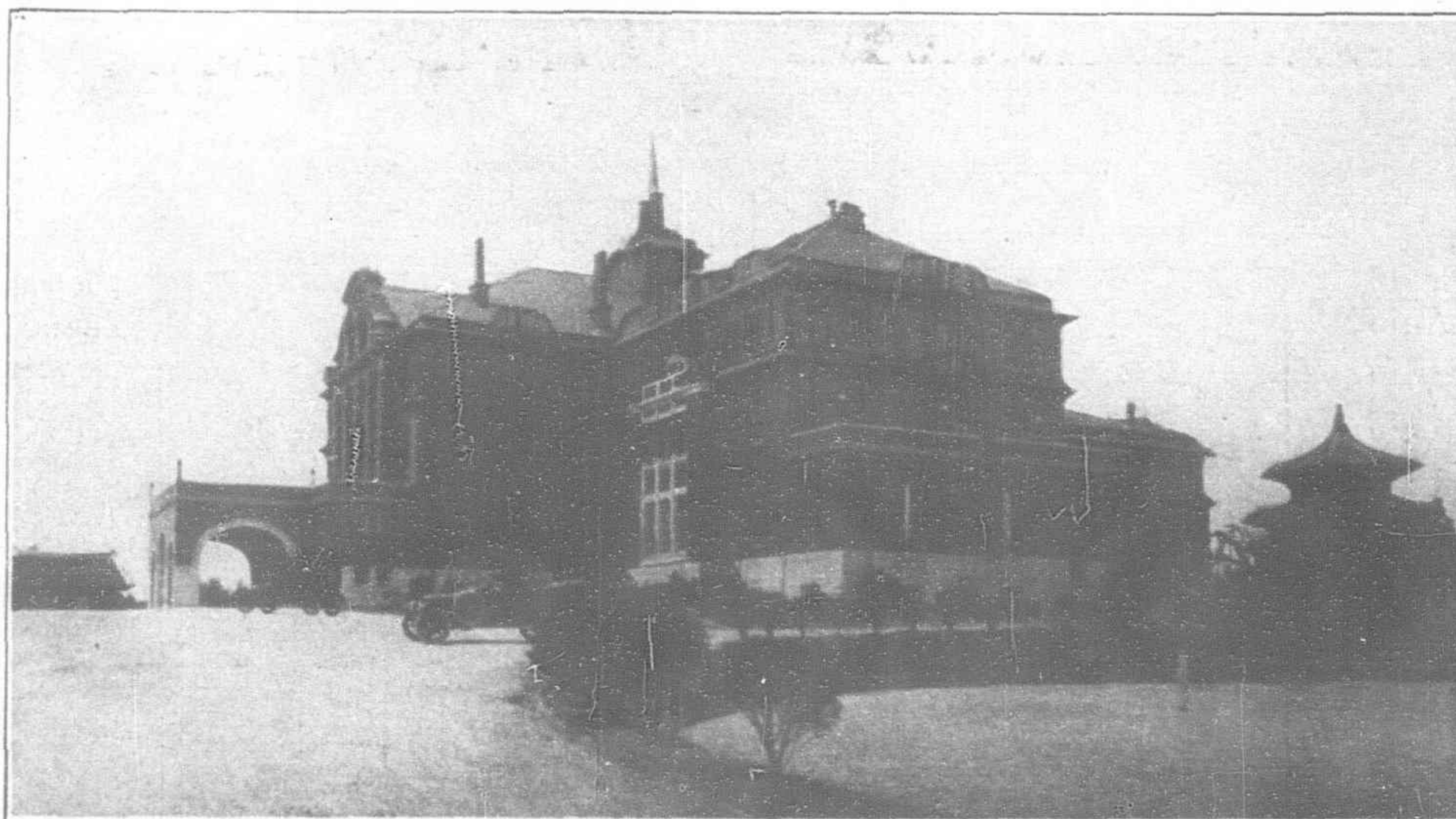
The total length is 162 miles with the sections between Sariin and Shinsen and between Jokai and Naido (31.2 miles in all) in operation. The section between Kasan and Miriki (5 miles) was opened to operation on September 1 of this year and the section between Miriki and Kaseimen (9.2 miles) is under construction. The transportation of agricultural products from the fertile plains served by the line as well as iron ore from the Ginsanmen district are the most important sources of revenue.

*The Heihoku Line:* A standard gauge project 77 miles in length connecting Mochuri on the Keigi line with Kisen, on which no work has been done to date.

*The Kannan Line:* A 2-ft. 6-in. line starting from Kanko and

extending to Koshu, Koyu and Manpochin, a total distance of 218 miles. There are two branches, one from Goro-ri to Kantai-ri (53 miles) and the other from Hojo to Choho, 1.7 mile. This line is primarily intended to transport lumber from the forest districts of the upper Yalu. Choho is the terminus of the Kanko-Choho line (17.7 miles) in which district is located the Kanko coal mine which has a daily output of 100 tons, but

is capable of considerable expansion with proper railway facilities to transport the coal to market.



The Chosen Hotel at Seoul, Operated under Contract by the South Manchurian Railway Company for the Korean Government Railways

*The Kanhoku Line:* This line, also of 2-ft. 6-in. gauge, like the Kannan line, was designed to transport timber from the upper Tumen River district. Starting from Kichishu, it will proceed to Keisanchin a distance of 205 miles. A branch is to start from Gosui and end at Komosan on the Seikai line. At present, the 24-mile section between Komosan and Shintan is under construction.



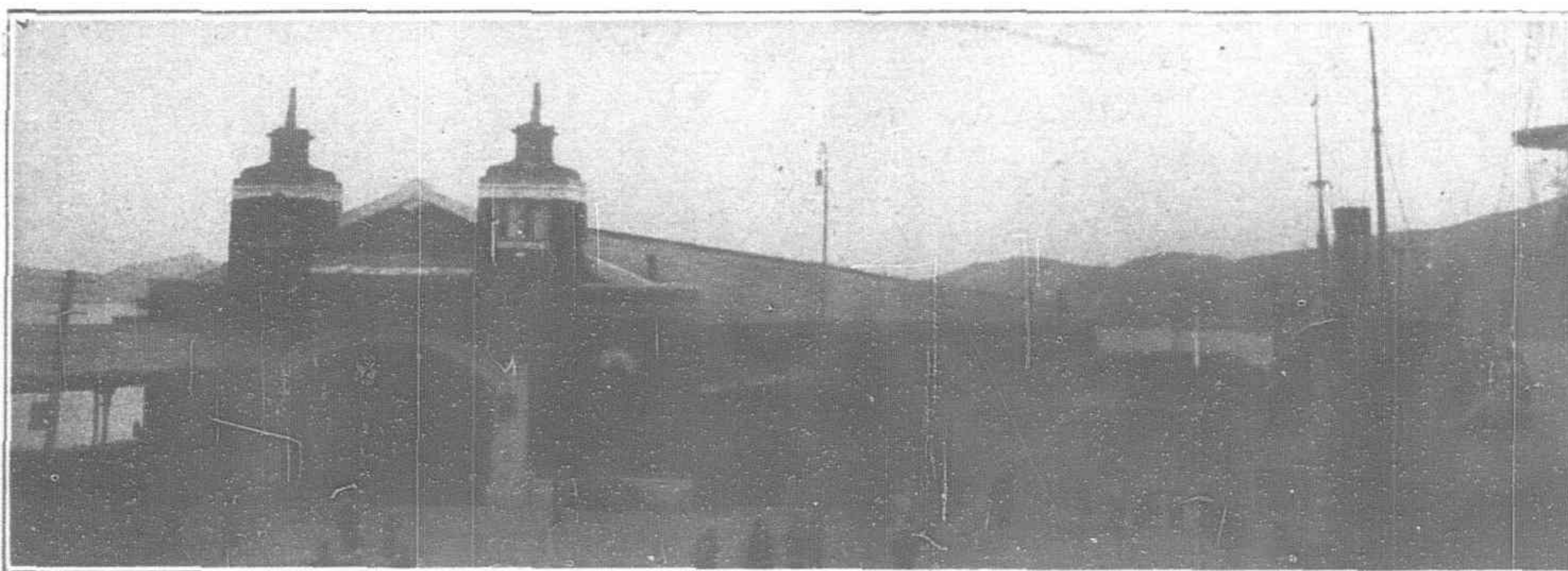
## FUSAN, THE GATEWAY TO KOREA



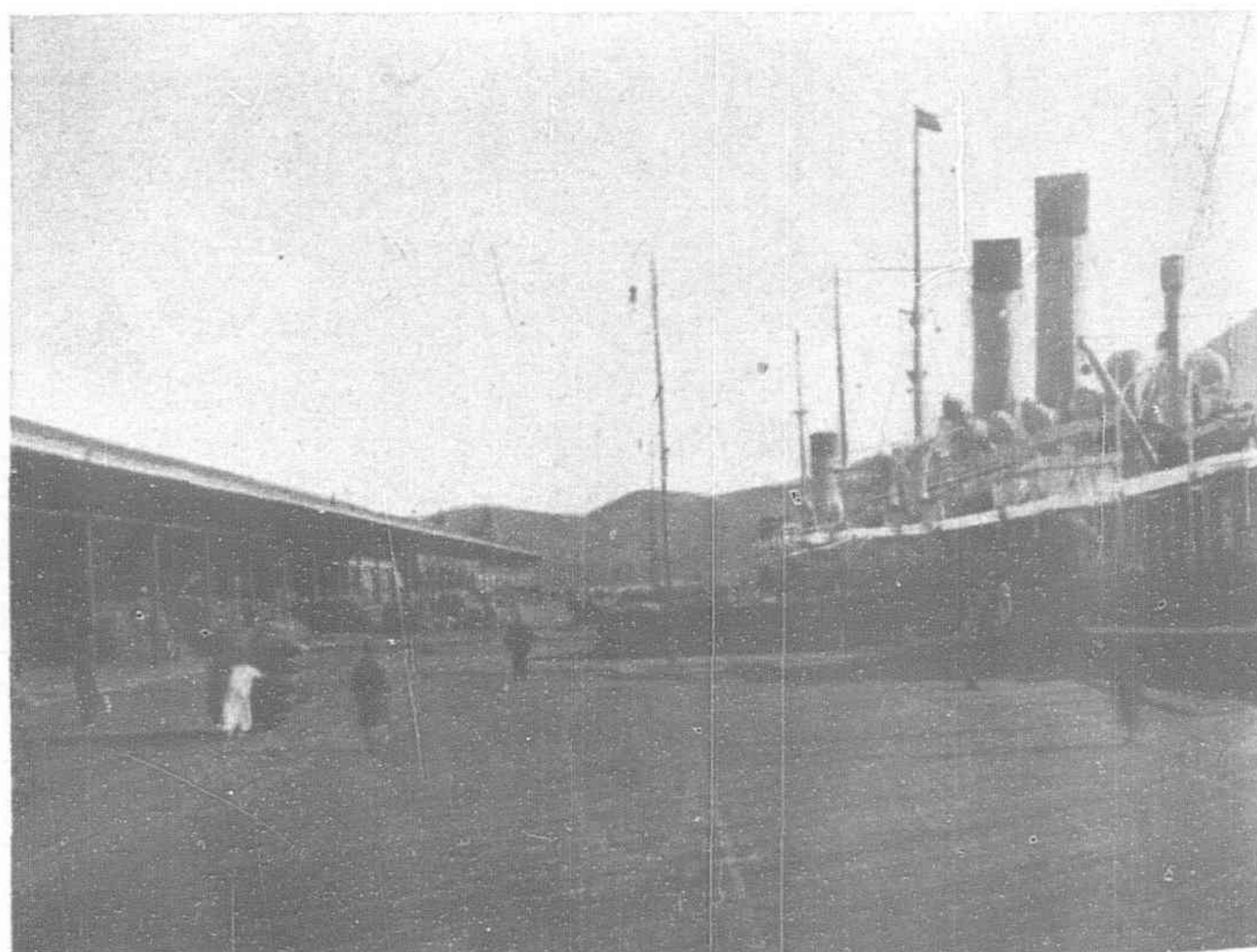
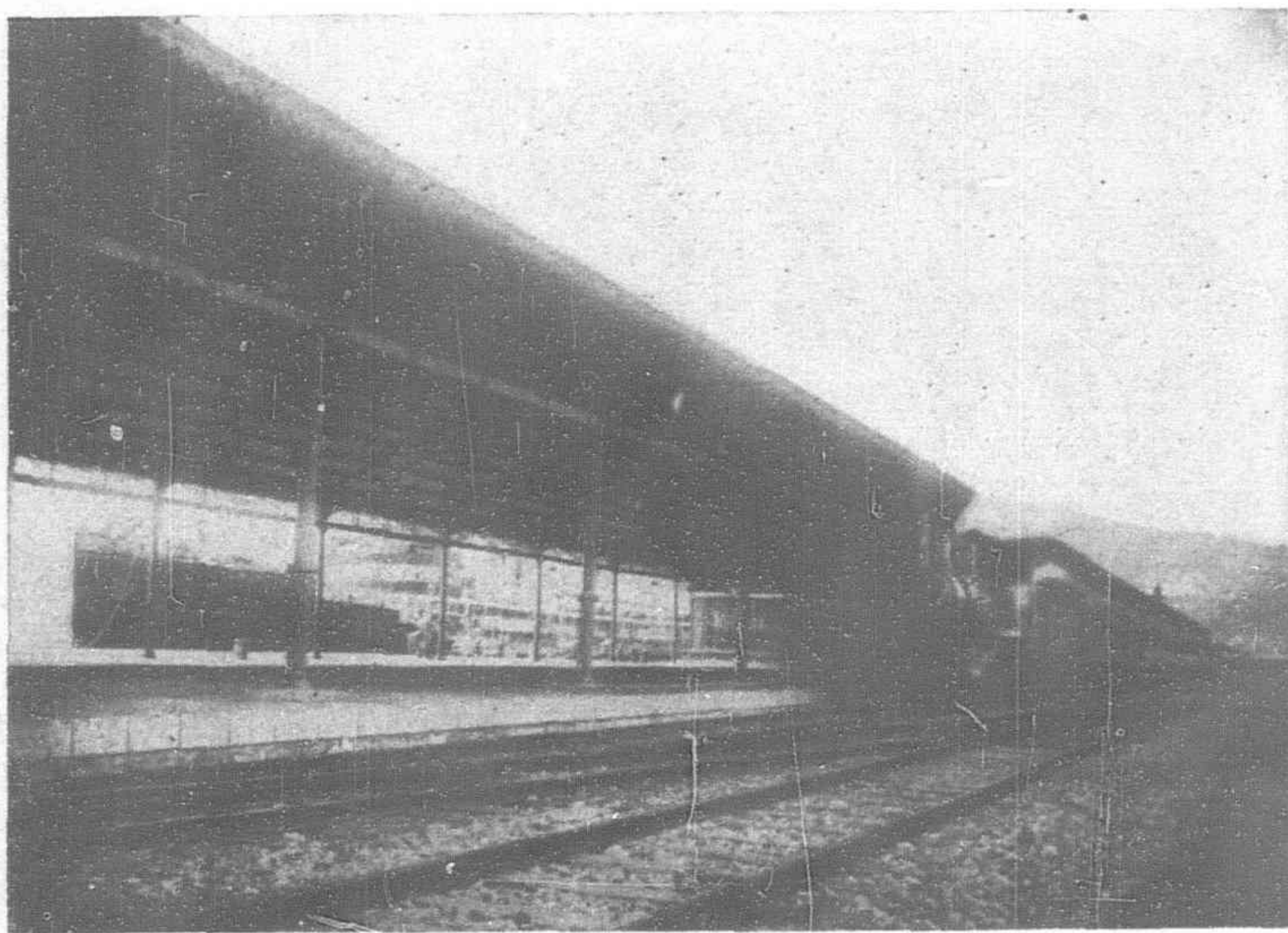
General View of the Port of Fusan, Showing Location of Railway and Steamship Wharf

### The Chosen Keinan Railway Co., Ltd.

The authorized capital of this company is Y.10,000,000, half paid up and with loans outstanding to the amount of Y.2,100,000. The head office is located at Ten-an on the main Keijo-Fusan government railway. The line



of the Zenra Hoku-Do government; has an authorized capital of Y.600,000 of which Y.450,000 is paid up and a loan amounting to Y.60,805 outstanding. The line, 2-ft. 6-in. gauge, is in operation on the section between Riri on the Konan line and Zenshu, a distance of 15½ miles. There is



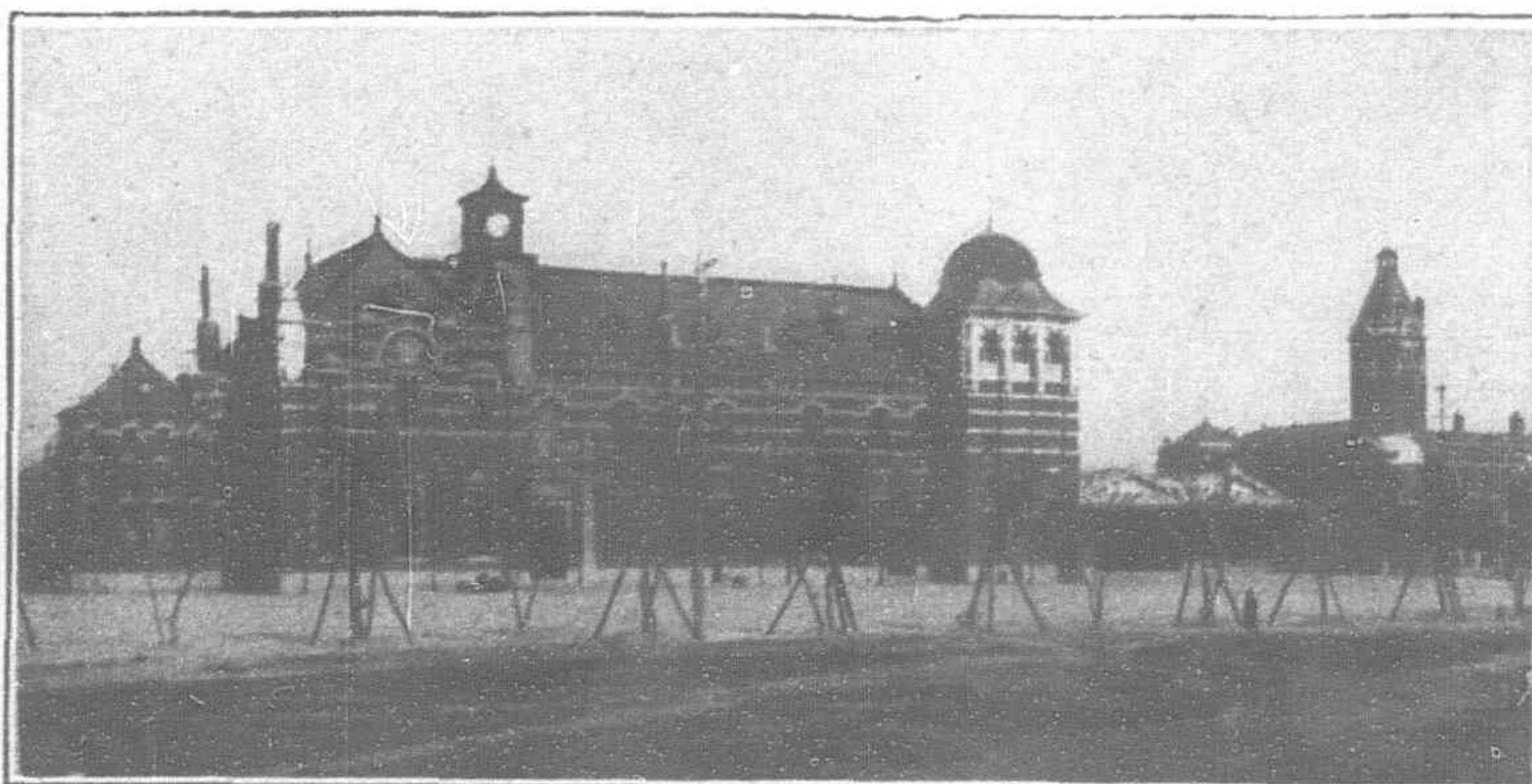
Fusan Pier

Showing Direct Connection Between Rail and Steamship

starts from the other side of Gunsan and extends to Anjo in Keiki-do by way of Tenan, a distance of 99 miles. The section between Ten-an and Kosan (46.8 miles) has been completed and is now in operation. The line is standard gauge.

### The Zenhoku Railway Co., Ltd.

This company with its head offices at Zenshu, the seat



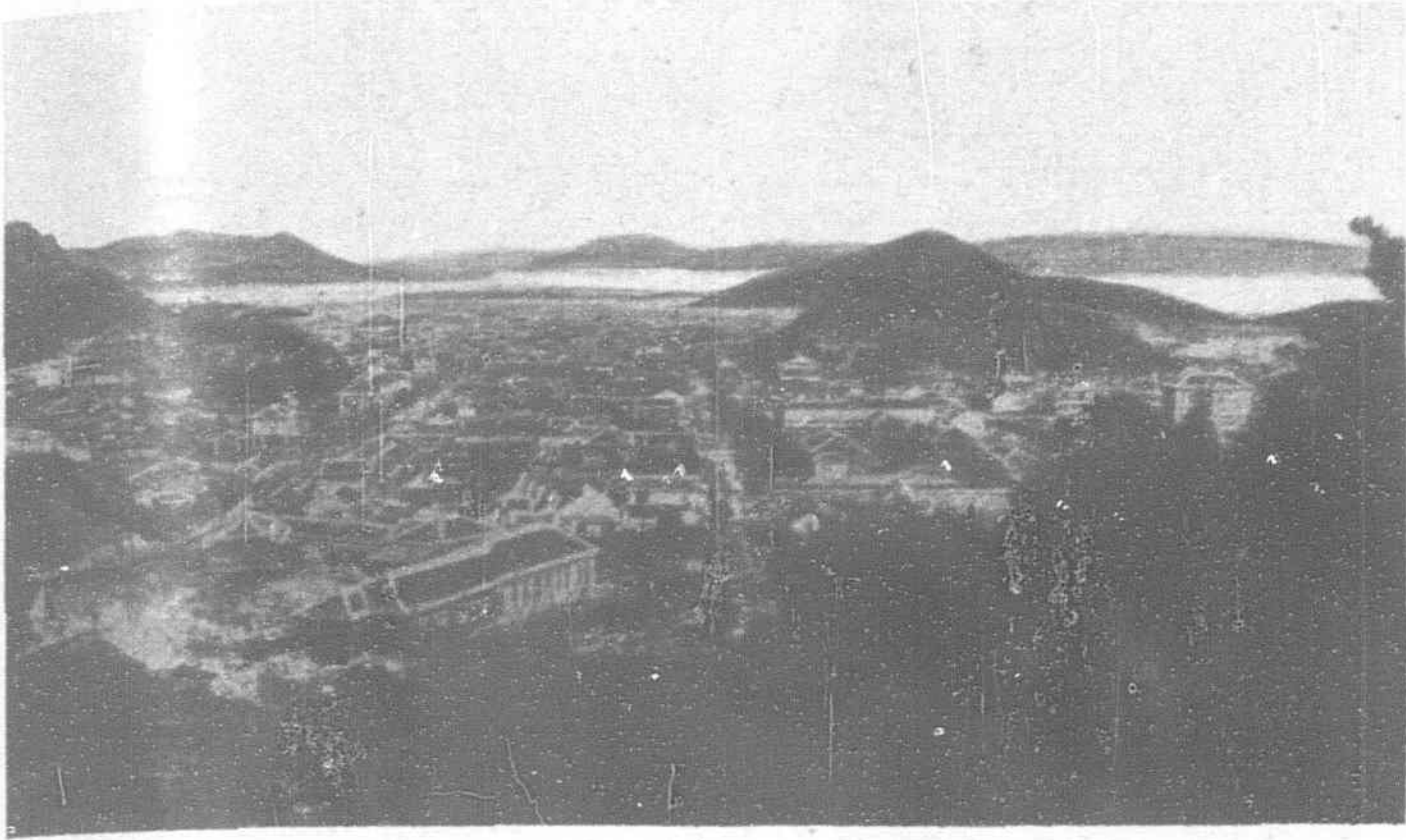
Station Hotel at Fusan Terminus of the Korean Railways

a vast stretch of rich agricultural land in the district served, contributing a very profitable goods and passenger traffic, enabling the company to pay more than eight per cent. dividends without the help of the subsidy. The business outlook for this line is very bright.

### The Tumen Railway Co., Ltd.

The head office of this company is in Tokyo with the





Mokpo, an open port on the South-Western Coast of Korea, the terminus of the Government Kanan Line



Masanpo, a port on Chinhae Bay, 55 miles west of Fusan, terminus of the Government Railway

operating office in Kainei. It has a capital of Y.3,000,000 all paid up with an outstanding loan of Y.100,000. Of the projected 57 miles of lines, a section of 31.5 miles between Kainei (on the Seikai line and Shoji) is now operating and the section between Shoji and Shokanchin (5½ miles) under construction. When all the line is completed it will be utilized for the transportation of agricultural produce from the Kanto district. The Chinese Tendo railway having been recently opened to traffic, it is expected that the volume of business over the Tumen line will be greatly increased. To facilitate means of transportation in the district the Tumen railway company is operating motor cars between Shoji, Onjo and Keigen.

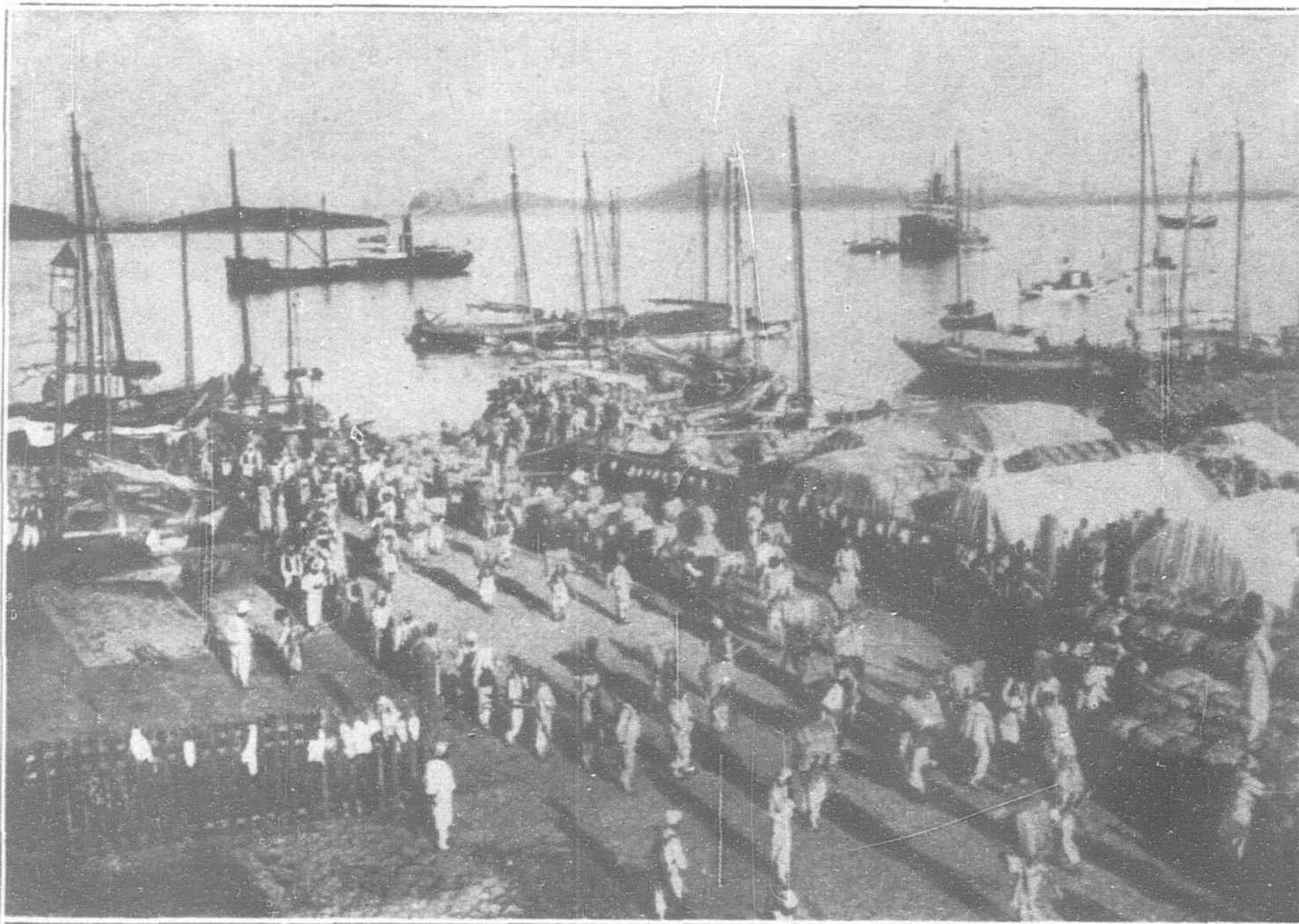
#### The Kongosan Electric Railway, Ltd.

The head office of this company is located at Tetsugen, in Kogen-Do. Its authorized capital is Y.5,000,000 with Y.3,000,000 paid up and a loan outstanding amounting to Y.4,200,000, in which the fund for subsidiary undertakings is included. The company

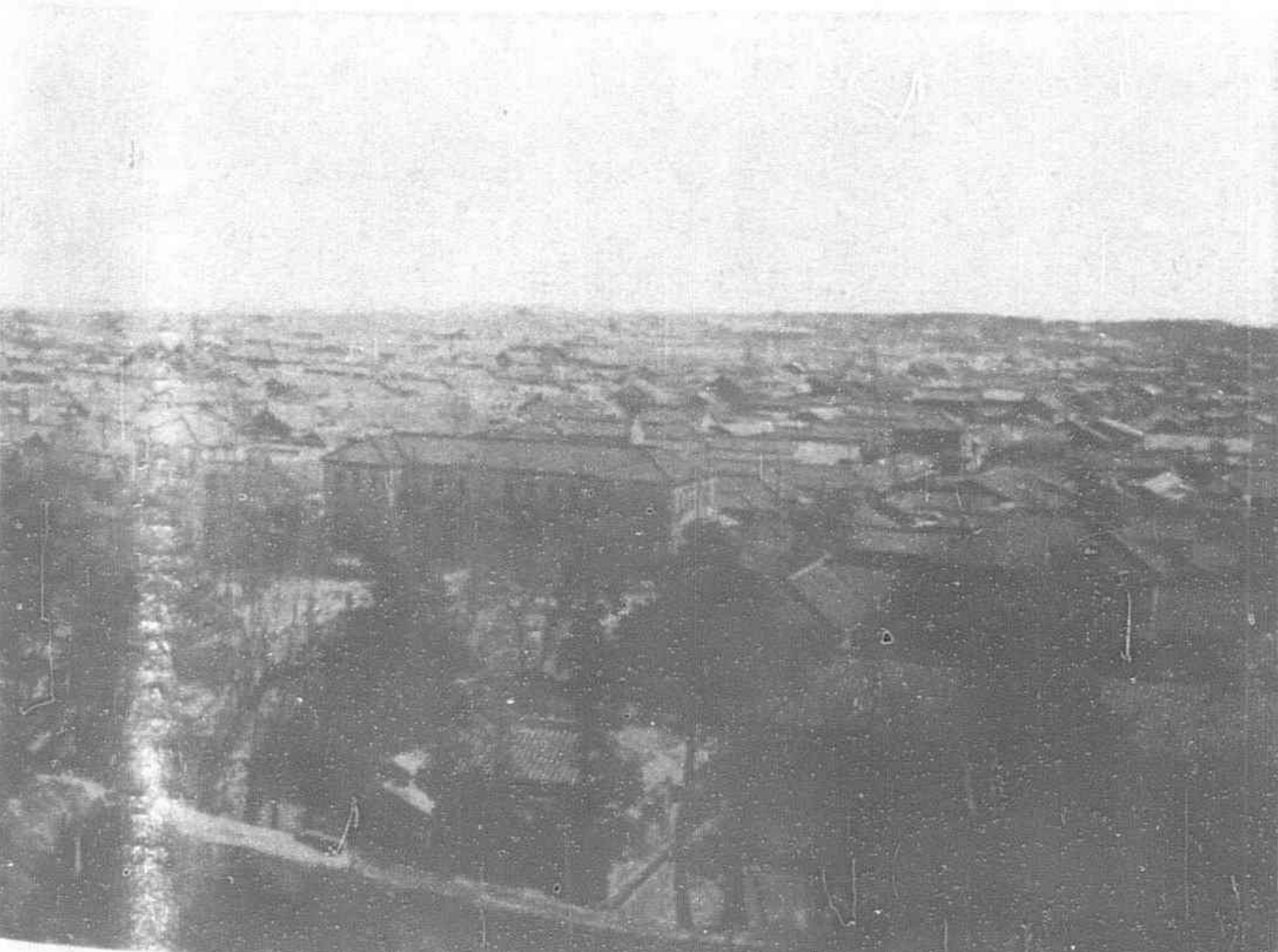
has erected a hydro-electric plant at Kasen, in Kogen-Do and is constructing an electric standard gauge railway 63 miles long, connecting Tetsugen with Kasen near Kongo-san and supplying electricity to the towns along the line. The section between Tetsugen and Kinka (18 miles) is completed and the necessary electric equipment was ordered from Japan. Due to the destruction of this equipment during the quake and fire of last year, its delivery has been delayed. In the meantime the company is operating steam locomotives to haul its trains over the open section. A summary of the equipment for this line is given further on.

#### The Kaisen Light Railway

This 2-ft. 6-in. gauge line is owned and operated by a private individual, Mr. Masanobu Tannowa. It is 23 miles long connecting Shin-Anshu (on the Kaigi line) with Sendo via Kaisen. This line was originally built for the exclusive transportation of iron ore for the Hokkaido steel company but owing to the gradual increase of passenger and goods



Kunsan, a busy Rice Port on the Western Coast of Korea, served by the Government Kanan Line and the Chosen Keinan Railway



The Port of Gensan, the Principal Port on the Eastern Coast of Korea



The Town of Yeiko, near Gensan



traffic along the line it was turned over for the public use. It is operated for the present without the subsidy.

### Other Railways

In addition to the above lines, the following four companies have been incorporated but have not yet completed their construction plans:—The Hokusen Railway Company, The Hokusen Kogyo Railway Company, The Keishun Electric Railway Company, and the Chosen Keito Railway. The projected length of the Hokusen railway is 85 miles connecting Rashin in Kankyo-Hoku-Do with Kunju. The section between Kainei and Kindo (46½ miles) will be operated by the Hokusen Kogyo Railway Company and the section between Suigen (Keikido) and Reishu (43.1 miles) by the Chosen Keito Railway. These lines are all of standard gauge. The Keishun Electric Railway Company have been granted a charter to build and operate a 3-ft. 6-in. electric line between Keijo and Shunsen a distance of 49.6 miles, but the company is not yet officially established.

### Summary of Private Railway Statistics

#### ZENHOKU RAILWAY COMPANY

Head Office, Zenhsu: Capital, authorized, Yen 600,000, paid up, Yen 450,000, loans, Yen 60,805: Construction costs, Yen 510,326: Gauge, 2'6": Locomotives, 6: Passenger cars, 14: Covered wagons, 21: Open trucks, 32: Section operated, Riri-Zenshu, 15.5 miles: No. of trains, 6: Number of passengers, 424,873: Freight, 64,738 tons: Revenue, Yen 261,543: Expenditures Yen 204,926: Profit, Yen 56,617: Government subsidy, none.

#### TUMEN RAILWAY COMPANY

Head Office, Tokyo: Capital, authorized, Yen 3,000,000, paid up, all, loans, Yen 100,000: Construction costs, Yen 2,987,819: Gauge, 2'6": Locomotives, 8: Passenger cars, 10: Covered wagons, 55: Open trucks, 35: Subsidiary undertakings, Motor car transportation from Shojo to Keigen and Onjo. Sections operated, Kainei-Shojo: Mileage, 31.5: Number of Trains, 3: No. of passengers, 109,011: Freight, 80,284 tons: Revenue, Yen 526,706: Expenditures, Yen 313,608: Profit, Yen 213,098: Government subsidy, Yen 85,780.

#### CHOSEN KEINAN RAILWAY

Head Office, Ten-an: Capital, authorized, Yen 10,000,000, paid up, Yen 5,000,000, loans, Yen 2,250,000: Construction expenses, Yen 6,154,861: Gauge, 4'8½": Locomotives, 4: Passenger Cars, 6: Covered wagons, 2: Open trucks, 50: Sections operated, Ten-an to Kosen: Mileage, 46.8: Number of trains, 3: No. of passengers, 227,222: Freight, 77,730 tons: Revenue, Yen 284,242: Expenditures, Yen 228,759: Profit, Yen 55,483: Government subsidy, Yen 422,339.

#### KAISEN LIGHT RAILWAY

Head Office, Gunguri: Capital, authorized, Yen 792,500: Construction expenses, Yen 798,500: Gauge, 2'6": Locomotives, 6: Passenger Cars, 8: Covered wagons, 6: Open trucks, 74: Sections operated, Shinanshu-Kaisen-Sendo: Mileage, 23: No. of trains, 4: No. of passengers, 107,781: Freight, 75,761 tons: Revenue, Yen 128,138: Expenditures, Yen 120,710: Profits, Yen 7,428: Government subsidy, none.

#### CHOSEN RAILWAY

Head Office, Keijo (Seoul): Capital, authorized, Yen 54,500,000, paid up, Yen 17,650,000, loans, Yen 13,150,000: Construction expenses, Yen 29,369,178: Gauge, 2'6" and standard: Locomotives, narrow gauge, 22, standard gauge, 8: Passenger cars, n.g., 84, s.g., 14: Covered wagons, n.g., 125, s.g. 13: Open trucks, n.g., 264, s.g., 28: Subsidiary undertakings, warehouses, and hot springs at Shinsen and hotel at Bukkokuji: Sections operated, Narrow Gauge lines, Keito Line, Daikyu-Hoko-Kakusan, 4 and 3 trains daily: Seigaku-Urusan, 92 miles. Kokai Line, Sariin-Shinsen and Naido-Jokai, 4 and 2 trains daily: 31.2 miles: Kannan Line, Kanko-Goro-Choho, 17.7 miles, 4 and 3 trains daily. Standard Gauge lines: Keinan Line, Masan-Gunhoku, 18.3 miles, 4 trains daily: Zennan Line, Shoteiri-Tanyo, 22.7 miles, 7 trains daily: Chuhouk Line, Chochiin Seian, 29 miles, 4 trains daily.

Number of passengers, 1,380,573: Freight, 266,435 tons: Revenue, Yen 1,333,467, Expenditures, Yen 1,149,472: Profits, Yen 183,995: Government subsidy, Yen 1,835,878.

Note.—The railway fare is five sen per mile and first class eight sen. Freight is charged one sen per mile per 100 *kin* for light articles and 13 sen per ton for bulky goods, with a charge of ten sen per mile per ton for hired cars.

### Electric Railways and Tramways

#### THE KONGO-SAN ELECTRIC RAILWAY

The power for operating this line will be obtained from the Kasen River one of the tributaries of the upper Kan, at a point 1,600 *shaku* above the level of the sea. Here a large reservoir has been created by damming the Kasen River with a stone dam faced with concrete 88 *shaku* high, 61 *shaku* at the bottom and 12 *shaku* at the top. The capacity of this reservoir is about 400,000,000 cubic feet, assuring a steady volume of 142 cubic feet at all seasons with a head of 773 *shaku* for operating the Number 1 power house of 6,900 k.w. capacity. Two smaller plants will be erected lower down the stream to be called the No. 2 and No. 3 power houses, the first to have a capacity of 3,400 k.w. with a head of 400 *shaku* and the other of 1,800 k.w. capacity with a head of 209 *shaku*. There is also a small steam plant generating 300 k.w., making a total power capacity of 12,400 k.w. which the company will develop as the demand for power and light requires. Equipment for generating 3,200 k.w. at the No. 1 power house was installed by November of last year and by the end of the present year the remaining equipment for operating the full capacity of the plant will be in place.

The head-gate is located about a mile lower than the reservoir. A concrete weir has been built at this place. The head race, 4,800 *shaku* long, was cut for the most part through solid rock and finished with concrete. The gradient between the head-gate and the pressure tank is 5 *shaku* giving a volume of 185 *shaku* per second. From the pressure tank the water is conveyed to the power house through two lines of flanged riveted steel pipes.

The No. 1 power house is a brick building divided into two parts. The first is a one-storied building 58 by 48 *shaku* housing the engine room and the other a two-storied building with the transformer room on the ground and the switchboard and distributing apparatus on the second. The machinery consists of one 4,600 h.p. water turbine driving a 4,063 k.v.a., 6,600 volt alternator at 514 r.p.m. and one 5,300 h.p. turbine driving a 4,700 k.v.a., 6,600 volt at 450 r.p.m. The exciter for the first set is 45 k.w., 124 volt and for the second set, 50 k.w., 125 volts. Four transformers (one in reserve) of 1,375 k.v.a. each and another set of four (one spare) of 1,600 k.v.a. raises the primary pressure of 6,000 volts to 66,000 volts.

The transmission lines from No. 1 power house to the Dojori sub-station (52 miles) are carried on iron towers. Between Dojori and the Tetsugen transformer station (5 miles) wooden poles are used. Iron towers and wooden poles are used to carry the transmission line between Dojori and the Keijo transformer station (50 miles), a total distance of 102 miles from the power house to the capital. A large amount of the current already generated is being used in Keijo, for commercial light and power. The iron towers are of mild galvanized steel 68' to 70' in height, the standard distance between towers being 600 *shaku* and the maximum distance, 842 *shaku*. Six overhead wires (three wires not yet strung) and one underground wire are laid. Larch poles 35 *shaku* and 55 *shaku* in length and .7 *shaku* diameter at the top are also used either singly or the shape of a triangle, the standard distance between each being 150 *shaku* and the maximum, 780 *shaku*. Three overhead and one underground wire are laid.

The wires are of hard drawn copper, No. 12 B.S. the distance between each being 7 feet. Transformer stations are located at Keijo and Tetsugen. The railway starts from Tetsugen station on the Keijo-Gensan main line and proceeds to Kasen via Kinka, Kinjo, Shodo and Shinan, a total distance of 63 miles. Kongo-san lies about 20 miles to the west of Kasen, the terminus of the line. The section between Tetsugen and Kinka (18 miles) was opened to traffic on August 1st of this year and the section between Kinka and Kinjo (14 miles) now under construction, will be completed next year.

1 *shaku*—0.994194 feet.



The line is standard gauge, single track, laid with 60-lbs. rails. The overhead line is of No. 30 hard-drawn copper wire, single trolley, catenary system using 1,500 volts d.c. The passenger cars are of the bogie type 45 *shaku* long over-all equipped with four 70 h.p. motors each capable of drawing a 30-ton goods wagon on a ruling gradient of one in forty. The cars are equipped with pantagraph, Westinghouse air-brakes and electric radiators. There are three cities in Korea where tramways are now in operation.

**THE KEIJO ELECTRIC TRAMWAY COMPANY, LTD:** The head office of this company is in Tokyo with its operating office in Keijo (Seoul). Besides operating the tramway the company also supplies electric light and power and gas. The length of open lines is 18.9 miles, that is, 9.9 miles of double track and 9 miles of single track section. The company is preparing to extend its lines to keep pace with the construction of new roads in the city. The line is a single trolley system with the power supplied from the company's own plant. The cars are operated from 5.30 a.m. until 1 a.m. and in the city districts there is a car every two to seven minutes, in the suburban districts, every nine minutes.

Capital, authorized, Yen 15,000,000, paid up, 10,000,000: Construction costs, Yen 3,352,339: Gauge, 3'6": Cars, 123: No. of daily passengers per mile, 561: Passengers carried, 33,105,468: Fare, average, 5 sen: Revenue, Yen 1,614,478: Expenditures, Yen 1,021,974: Profits, Yen 592,504.

**THE HEIJO ELECTRIC TRAMWAY:** This tramway is owned and operated by the Heijo prefectural government. It is double tracked 2.8 miles long of the single trolley system receiving its power from the plant of the Chosen Electric Industrial Company. Operating hours are from 4 a.m. to 1 a.m. with intervals of six to eight minutes between cars.

Head Office, Heijo: Capital, Yen 480,000: Paid-up, Yen 480,000: Construction costs, Yen 480,000: Gauge, 3'6": Cars, 10: Miles operated, 2.8: No. of daily passengers per mile, 388: No. of passengers, 2,307,807: Fare, 5 sen per section—two sections: Revenue, Yen 112,549: Expenditures, Yen 73,442: Profits, Yen 39,107.

**THE FUSAN ELECTRIC TRAMWAY:** This tramway is owned and operated by the Chosen Gas and Electric Company, Ltd., whose head office is in Tokyo and operating office in Fusan. Besides operating the tramway the company also supplies electric light and power and gas. The line is of single track, but double tracks are now being laid in the urban districts. It is of the single trolley system with the power supplied from the company's own plant.

Capital authorized, Yen 3,000,000, paid-up, Yen 2,700,000, loans outstanding, 530,000: Construction costs, Yen 671,260: Gauge, 2'6": Cars, 15: Miles operated, 10.7: No. of passengers per mile per day, 133: Total passengers, 4,400,758: Fares, 5 sen per section (6 sections), Revenue, Yen 273,828: Expenditures, Yen 199,198: Profits, Yen 74,630.

## Tokyo's Electric Light and Power Supply

**T**HE damage to electric lights and decrease in the consumption of power in and around the city of Tokyo, as a result of the quake in September, 1923, has been practically restored to former conditions.

Up to 80 per cent. of the total electric light and power consumption in Tokyo has been covered by the Tokyo Electric Light Company, Ltd. (Tokyo Dento Kabushiki Kaisha), and the remaining 20 per cent. by the Denki-kyoku or the electric bureau of the Tokyo municipality. For several years past the number of electric lights and power supply has been increasing at a rate of 15 per cent. a year. The capacity of the Tokyo Electric Light Co. and the municipal electric bureau, too, has been proportionately extended, accordingly.

At the end of August, 1923, the Tokyo Electric Light Company was supplying current for 3,180,202 lights in and around the city of

Tokyo, and the municipal electric bureau for 721,900 lights, a total of 3,902,102, which decreased to 2,153,815, as will be seen in the following table:—

COMPARISON OF ELECTRIC LIGHTS IN THE TOKYO DISTRICT BEFORE AND AFTER THE EARTHQUAKE, AND THE RECENT RECOVERY.

MONTHS	TOKYO DENTO	DENKI-KYOKU
End of Aug. (1923)	.. 3,180,202	721,900
Immediately after quake	.. 1,587,015	566,800
End of Sept.	.. 1,589,508	572,060
Do. Oct.	.. 1,637,056	597,884
Do. Nov.	.. 1,845,941	613,158
Do. Dec. ..	.. 1,953,289	641,520
Do. Jan. (1924)	.. 2,090,046	654,593
Do. Feb. ..	.. 2,173,379	663,910
Do. March	.. 2,244,639	678,084
Do. April	.. 2,326,567	691,663
Do. May	.. 2,370,433	702,676

The number of lights has registered a steady increase, reaching 3,073,109 at the end of May, 1924, a decrease of 900,000 lights in round figures.

On looking over the foregoing table, one finds that the decrease in the number of lights furnished by the Tokyo Electric Light Co., is considerably larger than that of the Tokyo municipal electric bureau in percentage, due mainly to the fact that the company had a large number of down-town customers, while the electric bureau had been furnishing more light in the residential districts, where the damage was not half so severe.

The aggregate total supply of the electric power in and around the city of Tokyo amounted to 248,406 k.w., at the end of August, 1924, dropping to 166,641 k.w., immediately after the quake. The Tokyo Electric Light Company lost about 80,000 k.w., and the Tokyo municipal electric bureau, about 100,000 k.w. but as in the electric light supply, the power consumption has also developed a steady increase.

ELECTRIC POWER CONSUMPTION

MONTHS	TOKYO DENTO	DENKI-KYOKU
End of Aug., 1923	.. 222,010 k.w.	26,396 k.w.
Immediately after the earthquake	.. 149,776	16,865
End of Sept.	.. 149,837	16,774
Do. Oct.	.. 150,928	17,056
Do. Nov.	.. 155,884	17,502
Do. Dec.	.. 167,438	19,190
Do. Jan., 1924	.. 178,288	20,355
Do. Feb.	.. 186,599	21,514
Do. March	.. 193,931	21,558
Do. April	.. 199,910	22,157
Do. May	.. 206,740	22,856

In the electric power supply, the Tokyo Electric Light Co., Ltd., has recovered 80 per cent., and the electric bureau about 70 per cent. The generating capacity of both sources of supply having been restored to pre-quake conditions, the consumption is expected to reach former conditions before the end of this year.

The Tokyo Electric Light Company is now erecting an electric bulb factory at Osaki-machi, a suburb of Tokyo, to be completed some time this autumn, that will turn out 2,000,000 electric bulbs annually. This, together with the 1,000,000 bulbs produced annually at the Honjo factory of the company, will be sufficient to cover the annual demand of the company.

The Tokyo Electric Light Company has been receiving its entire supply of bulbs from several companies, but since the opening of the Honjo factory, has been nearly able to meet its own requirements.

It is announced that the Bombay Port Trust have accepted the tender of Sir. W. G. Armstrong Whitworth & Co., Ltd., for a steel floating caisson for the entrance to the Merewether Dry Dock, Bombay. The caisson will be constructed at the firm's Walker Shipyard, Newcastle-on-Tyne.



# A New Super-Power Development in Japan

## Two 160,000 K.W. Plants for the Shinano River District

### The 39,000 K.W. Station of the Shin-yetsu Electric Power Company on the Nakatsu River

By T. Kokubo, Bachelor of Engineering\*

**N**ESTLING in the bosom of the Japanese Alps lie the prefectures of Shinano and Hida, through the centre of which flows the Shinano River with its many tributaries forming the drainage system for a catchment area of over 5,000 square miles. Here are located many hydro-electric plants furnishing light and power to the neighboring towns and villages and here also have come the important Tokyo electrical companies seeking sites for plants that will supply the ever increasing power demands for the growing industries and transportation needs of the capital. In this district will be erected two of the greatest power plants in Asia; one for the Shin-yetsu Electric Power Company and the other for the imperial government railway department, both plants to be 160,000 k.w. capacity. Although it is too early to say much about these super-power plants the plans for the Shin-yetsu plant on the Shinano River provide for a head race 13 miles long, delivering a volume of 6,700 cubic shaku under a 352 shaku (350 feet) head. Amongst the plants now in operation which merit special attention are the two owned by the Shin-yetsu Electric Power Company and located on the Nakatsu River, a tributary of the Shinano.

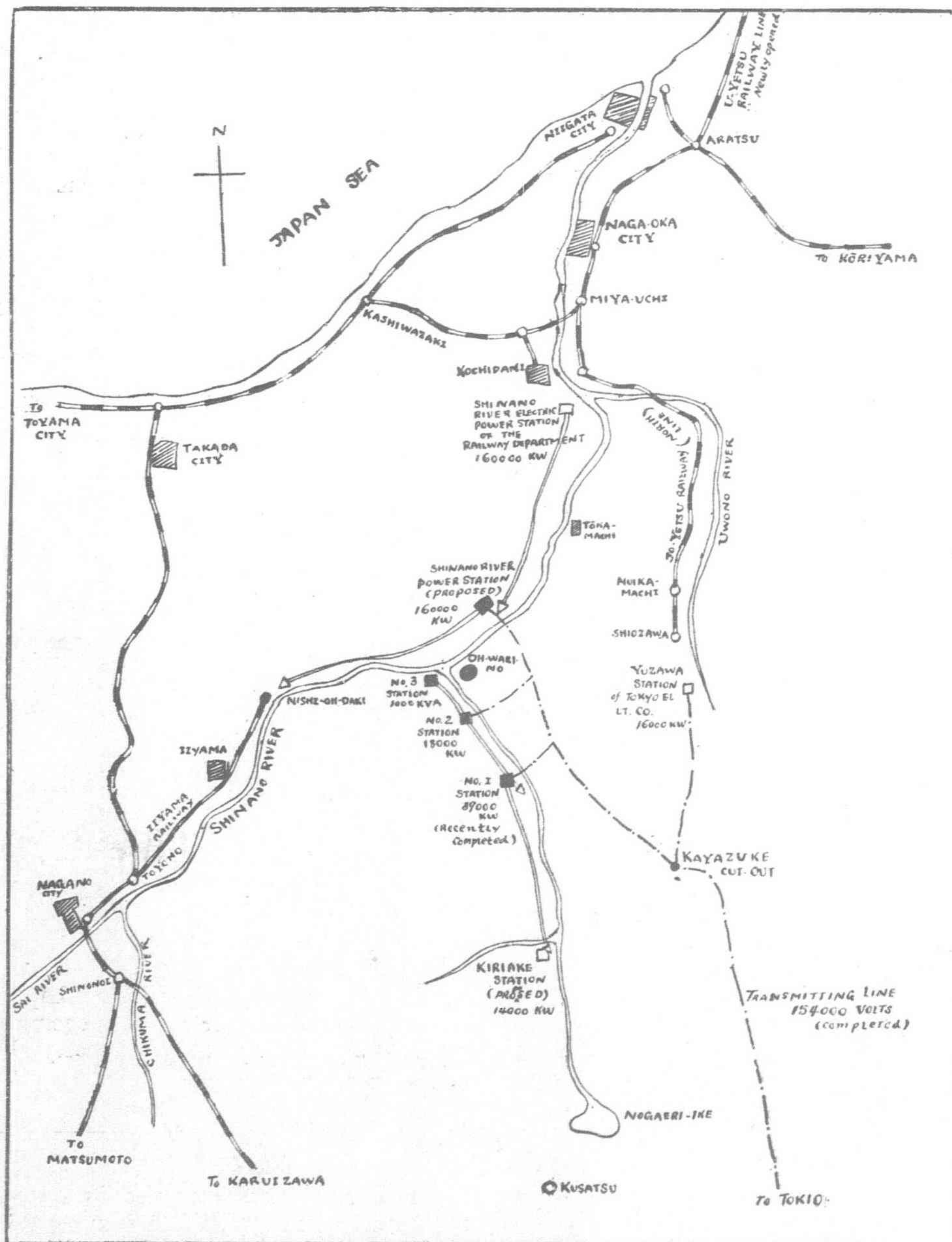
Two years ago, this company completed and placed in operation its No. 2 plant of 18,000 k.w. capacity and in August (1922) started work on the No. 1 plant, higher up the gorge of the same river. The site was in very difficult country presenting some of the most trying engineering problems yet encountered in hydro-electric work in Japan. The river valley at this point narrows down and is walled in by precipitous cliffs, making transportation of heavy machinery and construction material a never ending source of trouble. Nearly every conceivable method of transportation and carriage were resorted to in overcoming these obstacles and getting the materials on the job. The No. 2 power house of the company was called upon to furnish the current necessary for carrying out this work. At the time of the

earthquake of last year the work on the No. 1 plant was nearing completion but with the sudden decrease in the demand for current from Tokyo it slowed down. Upon the melting of the winter snows this spring, work was again resumed and on June 21 the water was turned on and the first trial runs made. After being inspected and passed by the electrical bureau of the department of communications the plant commenced to operate commercially from the first of August last, augmenting considerably the distributing capacity of the Tokyo Electric Light Company.

The location of the three power houses being in a district covered with snow to a depth of ten feet from November to May, the difficulties of transportation were enormous. More than one hundred thousand tons of machinery and materials had to be transported from the rail head. It was first necessary, however, to complete the Iiyama railway in great haste and utilize as far as possible the river. In this work alone more than 300 specially constructed lighters were placed in use and

men skilled in handling boats in rapids brought from other parts of the country. These boats and lighters will be employed in transporting much of the material for the greater plant to be erected a few miles lower down the river.

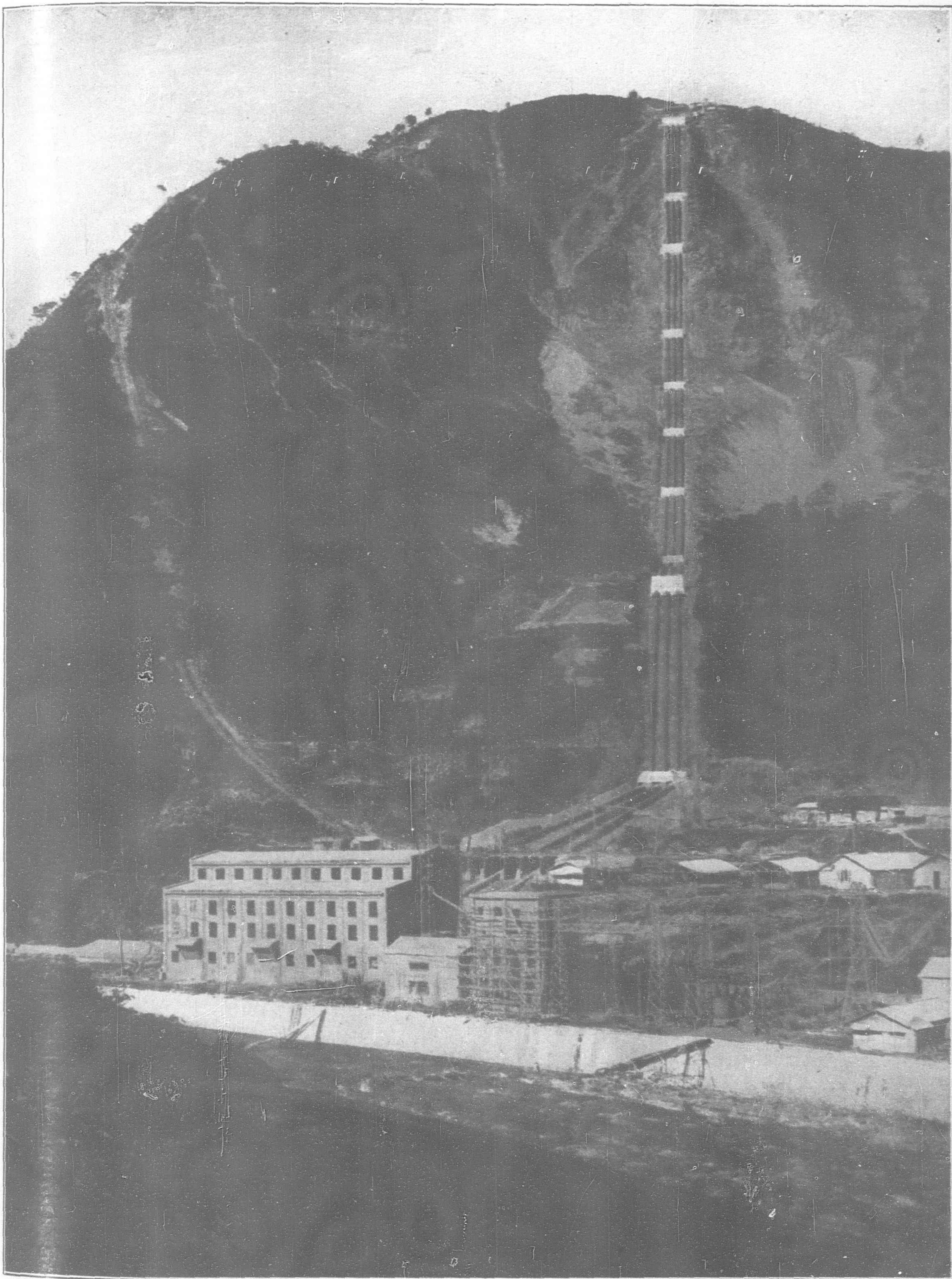
To facilitate the progress of the work, the government railway department built a branch from the main Joyetsu line to Tokamachi. The Iiyama Railway Company is to supplement this by building a line 25 miles long connecting Tokamachi with Nishi-daki (its present terminus) which will pass through the site of the projected super-power plant of the Shin-yetsu Electric Power Company. The progress on this and the super-plant of the railway department will depend largely on the construction of this railway extension. The Iiyama railway from Toyono to Nishino-daki, a distance of 25 miles, primarily intended to develop the district of Iiyama was capitalized at Y.600,000, but when the Shin-yetsu Electric Power Company started to develop the water power of



Map of the Shinano and Nakatsu River District showing the power house sites of the Shin-yetsu Electric Power Company and the sites for the two 160,000 k.w. plants projected on the Shinano River

\* Translated from "Ohm-shu."





No. 1 Power House of the Shin-yetsu Electric Power Co., Ltd. located on the Makatsu River. The picture shows the inclined railway track at the left, up which all materials were hoisted by electrically driven winches



the Nagano River the capital was raised to Y. 10,000,000, the majority stock being acquired by the electric company.

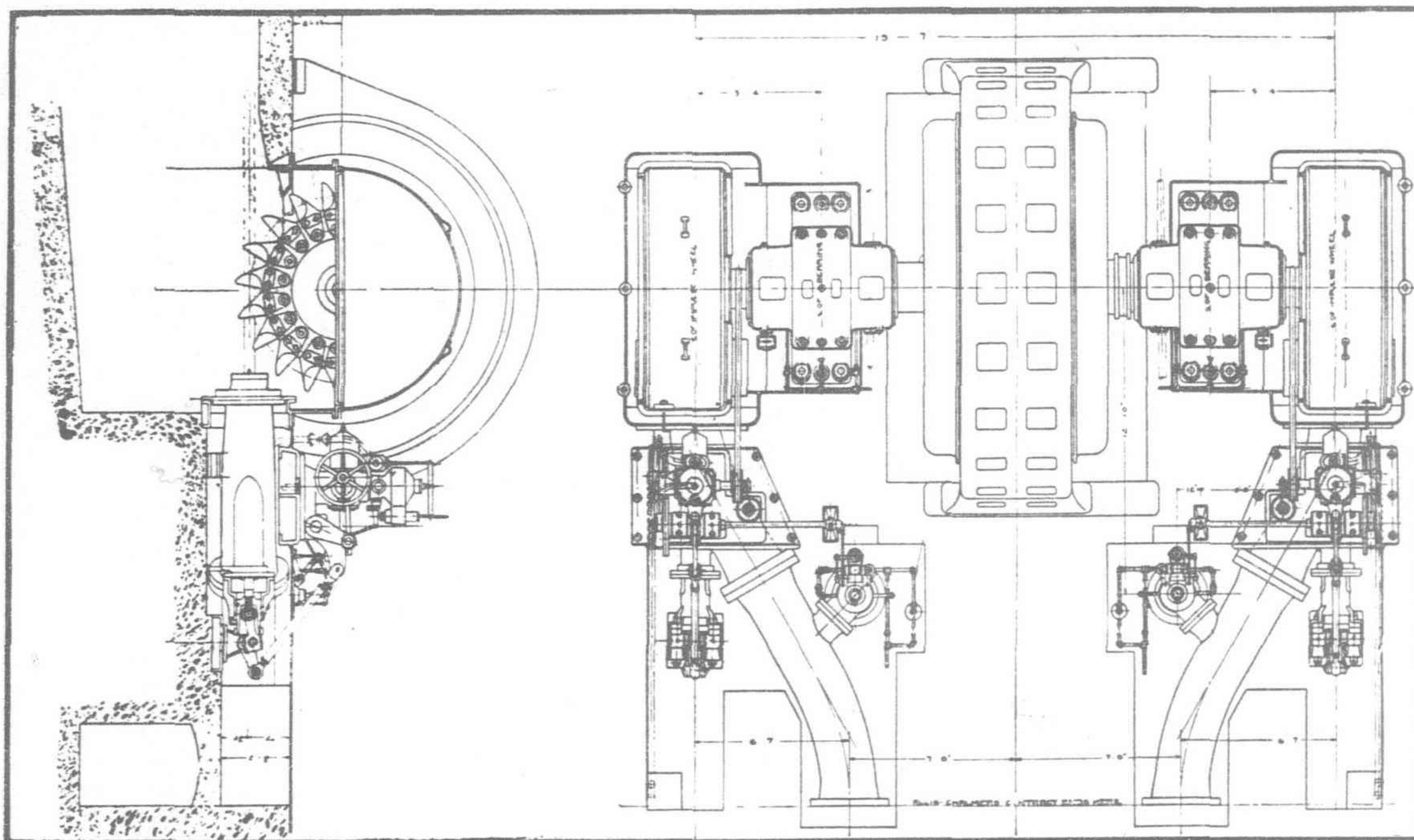
From Nishi-o-daki, the present rail head, it is one hour by motor bus to Owari, where the No. 2 and No. 3 power houses and the head office of the Shin-yetsu Electric Power Company are located. From this point, where the Nagano empties into the Shinano, to the site

of the No. 1 power house, the distance is about 2 *ri* (5 miles) and is covered by an electric tramway laid for construction purposes. Up to this point the transportation problem was more or less easily handled, but from the power house up the mountain to the intake (3,000 feet above sea-level) along 13 miles of cuts, canals and tunnels, the traveling was exceptionally difficult. At the intake a new power plant to be called the Kiriake station, with a capacity of 14,000 k.w., is projected. Further up the mountain at the source of the river (Nogaeri-ike) a scheme is materializing for the construction of a reservoir that will hold 500,000,000 cubic feet of water to provide against any low water emergency for the power houses along the Nagano River.

### No. 2 Power House

In building the No. 2 power house a small hydro-electric plant of 700 k.w. capacity was first installed in order to furnish power for construction work and supply lighting to the adjacent villages. This power enabled the work to proceed rapidly and was used for operating the tramway, electric drills, sand-diggers and excavators, winches, pumps, concrete mixers, rock crushers, repair shop and the many other motors used in tunnel driving, construction and erection work. Owing to the liberal use of this cheap power the No. 2 power house of steel and concrete construction was completed within one year despite the fact that for four months the work was thickly covered with snow.

The current generated at the No. 2 power house is boosted from 11,000 volts up to 66,000 at the open-air transformer station of the Tokyo Electric Light Company and together with the current from the power houses at Yuzawa, Komatsu, Iwamuro and others, is



Type of Allis-Chalmers Horizontal Impulse Wheel installed in the No. 1 Power House of the Shin-yetsu Electric Power Co.

each, 11,000 volts, 50 cycles. The switchboard instruments and appliances are from the Westinghouse Electric Manufacturing Company. There are four open-air transformer stations (one in reserve) each of 6,700 k.v.a. capacity, single phase where the first pressure of 11,000 volts is stepped up to 89,000 volts (with 66,000 taps). With star connections this pressure is still further boosted to 154,000 volts.

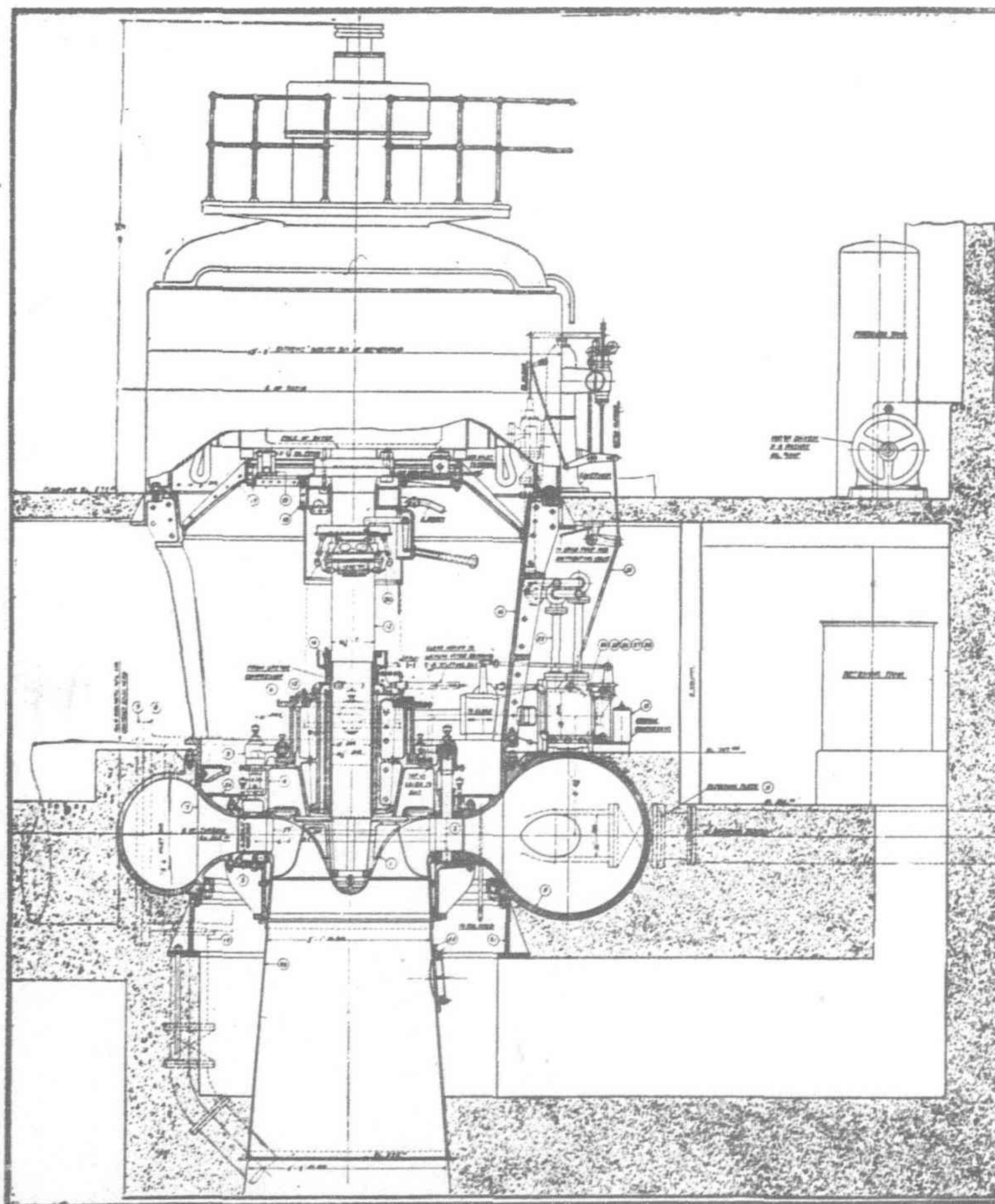
The water supply for this power house passes through a tunnel two *ri* in length fed from a regulating reservoir with an effective

depth of 8 feet and a capacity of 2,430,000 cubic *shaku*. The normal flow is 350 cu. *shaku* per second and with the maximum flow of 500 cu. *shaku* per second the reservoir will supply the plant for a continuous run at its full capacity of 18,000 k.w. for 4½ hours. A special feature of this plant is a rolling head gate.

### No. 1 Power House

The new power house just completed is located at a point 120 yards below the intake to the No. 2 plant in order that its used water may raise the volume of the river water which flows through the head race of the No. 2 plant.

The control dam in the main river at the intake is 100 feet long with an additional dam 50 feet long across the branch stream which flows into it at this point. The headgate is of the rolling type 40 feet in length by 5 feet in diameter. The head race is 20,900 yards long with a gradient of 1-1,250. Almost all of this is tunnel work which covers 19,649 yards, the rest being covered ditch. The regulating tank has an effective capacity of 2,500,000 cubic *shaku* with an effective depth of 8.7-ft.



Type of Francis Water Wheel built by the Allis-Chalmers Mfg. Co. installed in No. 2 Power Plant of the Shin-yetsu Electric Power Co.

transmitted to the Kameido transformer station at Tokyo, a distance of 127 miles. The capacity of the plant is 18,000 k.w.

The effective head of water is about 560 *shaku* (557 feet) with a flow of 500 cubic *shaku* per second. There are two Allis-Chalmers Francis water wheels of 13,000 h.p. each working at 600 r.p.m. direct connected to two General Electric generators of 10,000 k.v.a.



The flume pipes are three in number arched and lap riveted. The total length is 2,697 feet with a diameter at the top of 5 feet and a thickness of  $\frac{3}{8}$  inch increasing to  $1\frac{1}{8}$  inches at the lowest part where the diameter of the pipe reduces to  $3\frac{1}{2}$ -ft. These come together in a Y, the ends of which taper off to the sluice gate valves. The total weight of these pipes is 2,200 tons and were supplied by the Kellogg Company of America.

The power house building has a total area of 1,124 square yards with 748 square yards devoted to the turbine and generating room. There are also three smaller houses 3 by 94 *tsubo*. The generating room is equipped with an Hidatchi overhead traveling crane 38-ft. long with a lifting capacity of 55 tons. There are three motors 80, 30 and 10 h.p. respectively, with a speed of 8-ft. in winding, 75-ft. in longitudinal and 35-ft. latitudinal movement per minute.

The generating equipment consists of three Allis-Chalmers horizontal axis impulse water wheels with overhung single jets and independent control developing 18,000 h.p. at 3,000 r.p.m. with a specific speed of 3.43. These are direct connected to three General Electric generators, rated at 14,444 k.v.a. three-phase, 50 cycles, 11,000 volts, with a rated efficiency of 97.2 at full load, 96.6 at three-quarter load and 95.6 at half load. A Westinghouse power regulator of the broad range type is also installed. The 235 k.w. 250 volt General Electric exciter is driven by a 400 h.p. impulse wheel at 985 r.p.m. manufactured by the Dengyosha Company.

The auxiliary equipment of the power house consists of three station transformers of which two are three-phase 100 k.v.a., 11,000 volts—220 and 110 volts and one three-phase 350 k.v.a. transformer 11,000—3,300 volts. There are two 5 k.w., 220 volt generators operated by electric motors for charging the accumulator which has a capacity of 100 amp. hours, 220 volts, discharging in three hours: two 15 h.p. motors for the oil pump attached the speed regulator: one 3 h.p. motor for the air compressor attached to the oil tank of the speed regulators: two 25 h.p. motor-driven cooling water pumps. One set of the above equipment is for reserve purposes. The open-air transformer is furnished by the Tokyo Electric Light Company and is provided with four (one in reserve) single-phase oil transformers, 15,000 k.v.a. manufactured by the General Electric Company. The first pressure of 11,000 volts is stepped up to 89,000 volts and with star connections it produces 154,000 volts. The cooling water comes from the reservoir supplied by the motor-driven cooling pumps.

The difficulties surrounding the construction of the No. 1 power house were trying in the extreme, especially in the transport of materials from the power house site to the head tank. Up this incline a winding track had to be built with the cars hauled up by winches operated by motors. One of these motors of 550 h.p. operated a winch which raised a load of 50 tons and another of 300 h.p. operated another winch raising 25 tons. Several special motors were also used to raise loads of ten tons in laying the iron pipes in the head flume. In addition, a tramway line 13 miles long (2'6" gauge) was laid from the entrance of the gorge to the power house site on which 24 electric locomotives were in constant operation.

One of the features of this construction job was the two huge stone-crushing plants operated by electricity and equipped with 200 h.p. crushers which had to be erected to supply the work. As the river bottom could not furnish the large amounts of gravel and sand required for concrete mixing, a side of the mountain was blasted out to provide material that was crushed to dust and the screenings used as a substitute for sand and gravel. Over 8,000-lbs. of blasting powder were used in two blasts and over Yen 500,000 expended on the crushing plants alone.

The highest head of water in Japan (1,980 *shaku*, effective, 1,850 *shaku*) is used at the power plant of the Besshi copper mine (owned by the Sumitomo company) but the capacity of the power plant is only 4,000 k.w. Compared with this, the head of water at the No. 1 power house of the Shin-yetsu company generating more than 200,000 k.w. is the most powerful in Japan. The difficulties in laying the pressure pipe under these conditions were unparalleled in Japan. At one place it was necessary to lay the pipe at an angle of 50 degrees during which one engineer was killed and several workmen injured.

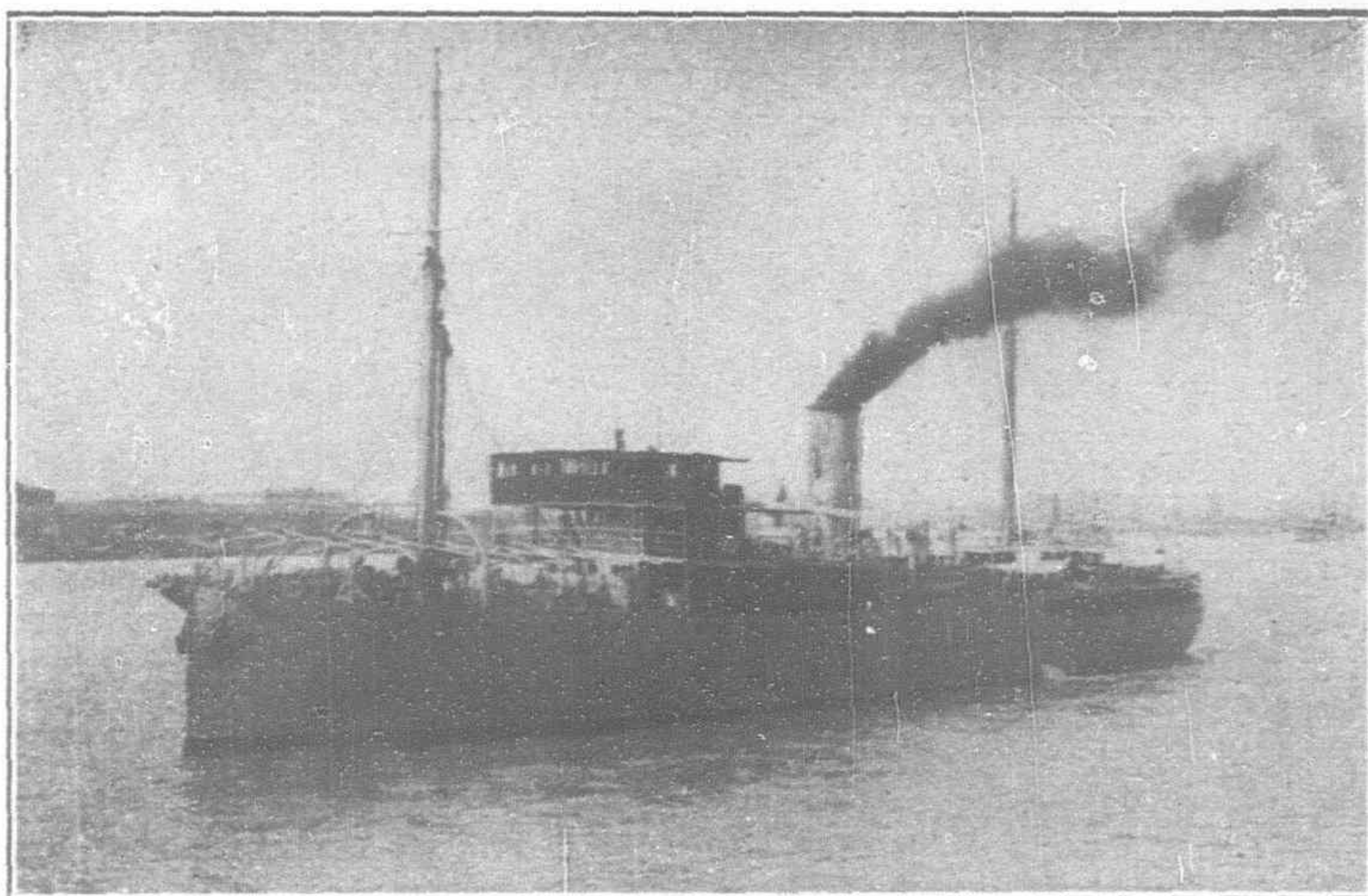
Interest in this plant has not ceased with its completion as there still remain difficulties that must be met and solved in order to assure its safety and operation during the winter months. Then all the drainage channels in the catchment basin will be blocked

with snow and a continued snow-fall may start an avalanche that might block the head entrance. Again, the districts over which the transmission line passes are covered deep with snow during the winter months and the transmission of a 150,000 volt current through this snow-covered territory will be watched with the greatest interest as it is the first time it has been attempted in Japan.

## New Customs Cruiser "Hai Hsing"

THE New Engineering & Shipbuilding Works, Limited recently launched a new cruiser for the Maritime Customs at their yards in Shanghai. The vessel attained a speed of 13 knots on its trial trip and in every way met the requirements of the specifications.

The vessel is of the combined bridge and forecastle type, having straight stem and cruiser stern built of steel in accordance with the classification rules of Lloyds for 100 Al. The hull is divided longitudinally into eight water-tight compartments, with three steel decks, an upper bridge deck, navigation bridge and flying bridge deck. With two masts and a single funnel the vessel presents a very smart appearance. Ample cabin accommodation for the captain is arranged on the upper bridge deck and on the combined forecastle and bridge deck there are comfortable quarters for the deck and engineer officers.



The Customs Cruiser "Hai Hsing"

The upper deck are fitted for the accommodation of foreign lightkeepers and Chinese crew, with spaces for spare cabins, bath-rooms, lightkeeper's mess room, sick bay, armoury, etc.

### Powerful Machinery

The deck machinery comprises:—A powerful steam windlass on the forecastle deck specially designed for handling various sizes of buoy chains and cables. On the forward and aft side of the foremast is fitted a 5-ton winch, one to serve the 10-ton buoy davit and the after winch for handling 15 tons lifts in conjunction with a steel derrick. A one-ton steam capstan is fitted on the upper deck aft for warping purposes. The propelling machinery consists of two sets of triple-expansion, surface-condensing engines, having inverted cylinders and three cranks placed in line directly over the crank shaft, designed to be entirely independent for propelling purposes. All pumps are driven direct by separate engines. Steam is supplied at 190-lb. per sq. inch.

A Cochrane donkey boiler is installed for use in port and a very complete set of engine room auxiliaries of the latest type is provided for the special duties to be carried out on board. The engineers' workshop requires special mention, being fitted with lathes, shaper, drills and grinder, all electrically driven and provided with accessories with which repairs to the machinery on board and on the stations can be handled when required.

Electric light is installed throughout the vessel and a Marconi wireless outfit of the latest type completes the list of special equipment.

The dimensions of the *Hai Hsing* are as follows:

Length overall, 260'0"; length B. P., 250'0"; breadth moulded, 28'0"; depth moulded to upper deck, 21'0".



# The Electric Home in Japan

## A Vast Field for the Merchandising of Electrical Appliances

**A**N electric exhibit was recently held at the Mitsukoshi department store in Tokyo in which a fully equipped electric home of two stories was erected having one-half the rooms furnished according to Japanese methods and the other half in accordance with the most up-to-date western ideas. The foreign half of the house was equipped throughout with modern electric light fixtures, electric fans, portable lamps, electric kitchen, irons, and the many other household conveniences so popular in other countries. This exhibit was held under the auspices of a society headed by Viscount Goto in which all the Japanese and most of the foreign manufacturers of electrical appliances participated. The widespread use of cheap electric power in Japan has produced a decided tendency on the part of the people to use electric household appliances and the exhibit was designed to develop more rapidly this field of electric merchandising and at the same time diminish fire risks by supplanting the old Japanese charcoal heaters, the most frequent cause of conflagrations.

In discussing this new tendency, Mr. I. W. Baker, representative of the Westinghouse International Electric Company in Japan, precedes a most interesting report on electric merchandising in that country by the statement that "*Japan has staked her future on the development of her greatest national resource, water power. Before many years, this nation will be the most perfected example of a completely electrified country.*" He then proceeds to say that in the past, electrical merchandising in Japan has received very little consideration. Lately, however, the subject has been given much thought and Japan will shortly experience a big boom in the use of electrical appliances.

This condition does not exist on the other electric devices for lighting, railway and industrial power, which have developed steadily since the first bipolar motors were installed in the nineties by the Tokio Electric Light Company. Conservatism reigned for twenty years, but the rate of growth of these electric services during the past ten years probably has been exceeded in no other country. The demand in Tokio doubles every five years.

Although the power companies are expanding as rapidly as possible to take care of the needs of the communities which they serve, they have barely been able to keep abreast of the demand for electric lighting and power. Therefore, they have not carried out many campaigns for the installation of electric heating and cooking appliances, even though the demand for these appliances exists.

The importance of these needs can be realized by recalling that Japan is second only to the United States in the number of homes wired for electricity. The power stations of Japan have a connected service to twenty-three million people, which is more than the combined electrical users of the rest of the world excluding only the States. Ultimately every home in Japan will be electrified as the increasing shortage of kerosene, coal, charcoal and wood will make them a luxury. Even at the present time the fact that electric heat can be purchased on a sliding scale reaching 2.6 sen (1.3 cents) a kilowatt-hour when the monthly consumption exceeds 600 kilowatt-hours is causing dealers in soft coal retailing at 60 yen (\$30.00) a ton, considerable apprehension.

It is expected that the coal supply of Japan will be exhausted in fifty years. However, by this time the eight million kilowatts of white coal, which are economically applicable, will have been developed for meeting most of the demands now fulfilled by coal.

One of the most progressive central stations in Japan in regard to merchandising is that of the Kyoto Electric Light Company which follows the modern method in their endeavor to load up the power lines with profitable load from home appliances. Low prices are quoted on all appliances, and in many cases the partial payment plan is allowed. Special monthly rates are given for users of cozy glow and similar air heating devices. This company maintains a show room in which constant demonstrations are in progress, educating the people in the use of electric appliances. It is stated that this show room is conducted at a considerable loss to the company, as the profits from the sale of goods fall far behind the running expenses. However, it is expected that the benefits

which will result in the future from loading up the power lines will compensate for all such present losses.

Another field receiving special attention is that of the Tokio district which is supplied by the Tokio Electric Light Company. The merchandising situation here is probably the most developed of any city in Japan. There are numerous dealers handling electric appliances, and the people of Tokio are in general well acquainted with the advantages of the use of electric current. Perhaps the greatest single obstacle to the sale of electric appliances has been the lack of day current which has been supplied only during the hot months of July and August.

It has been impossible in the past for the central station to build power plants fast enough to keep up with the night demand, not taking into consideration the supplying of day power in the colder months when water was scarce in the hydro-electric plants. However, by an amalgamation of practically all companies within 200 miles of Tokio, coupled with judicious financing operations, the power supply has been raised to 300,000 kw. Furthermore, in two years the supply will be 600,000 kw. which includes a 100,000 kw. steam plant.

In anticipation of this plentiful supply which will permit a twenty-four hour service, the Tokio Electric Light Company is planning an active merchandising campaign to load up its lines. Heating appliances and irons will be rented or sold on the installment plan. Motor-driven appliances will be tested and recommended to the public.

The recent expansion of power supply in the Osaka district of Japan has greatly stimulated the efforts of dealers and commercial departments of central stations in that locality. One dealer has a five-story building entirely devoted to exhibits of electrical material. Model kitchens are shown of the different sizes to suit any type of Japanese home. In smaller kitchens the electric features are confined mainly to a two kw. hot plate equipped with an aluminium pot for cooking rice. The more elaborate outfits include such items as a 3-19-B range, electric washing machine, dish washer and hot water tank equipped with bayonet heater and thermostat.

The Osaka district has not been so plentifully supplied with power in the past, but the recent water power developments by the Nippon Electric Power Company, Daido Electric Power Company and the Ujigawa Electric Company will increase the supply from 150,000 kw. to 450,000 kw. Also, the steam station supply will be increased from 150,000 kw. to 300,000 kw. These will provide for peak loads or shortages in the water supply.

In carrying out the electric idea in Japan, the path of least resistance has been followed by some local manufacturers who are attaching resistance coils to heating appliances in common use which ordinarily are adapted for charcoal. For example, the charcoal brazier or *hibachi* has been electrified, the replacement being carried so far that the coil is concealed in a piece of imitation charcoal made of cast iron. Another clever adaptation occurs in the Japanese sad iron. This is a small iron weighing less than a pound and it is equipped with a long handle for smoothing seams. The smoothing of cloth with a hot iron is a western idea, as in Japan this has always been done by stretching the cloth when wet on a board and letting the sun do the rest. Of course, such a process is slow and troublesome and with the shortage of household labor a quicker method must be used. For any heavy smoothing work the small Japanese iron is being superseded by the three and six-pound irons which are being built in large quantities by local makers. The three-pound electric iron meets with greater favor at present, primarily because it does not blow fuses when installed in ordinary lamp circuits.

Another local heating appliance is the rice cooker which is nothing more nor less than a one or two kw. hotplate with suitable brackets for supporting a rice kettle over the coils. It has been found by test with a Westinghouse 2-19-B range that rice can be cooked very cheaply and quickly in the oven which works on the fireless cooker principle. It is expected, therefore, that revolutionary methods of cooking rice will be adopted by the new generation, with the aid of electricity.



A great deal is expected from the use of electric heat in the home. This would not be expensive as it is not customary to heat a house or even a room to seventy degrees. What is desired is a clean, simple form of heater. The winters in Japan are short and the temperature rarely falls to 0° F., hence, an air heater or cozy glow of one-half to one kw. is quite sufficient for a room. At present this local heat is supplied from *hibachi* which require replenishing and cleaning and in addition throw off fumes causing illness and even death. Another disadvantage lies in the fire risk. It is not uncommon for 300 to 400 houses to burn following some accident to one of these charcoal stoves.

The great earthquake and fire in Tokio and Yokohama of September 1, 1923, was no doubt started in many places by these crude open fires. One of the important points which had considerable to do with the widespread destruction, was the multiplicity of places where these fires started. Fire seemed to break out in every quarter and the large number of conflagrations were no doubt largely started by the *hibachi*. If electric heat had been more universally in use, it is certain that the fires would have been less numerous. The great disaster, of course, destroyed vast amounts of electrical appliances, all of which will be replaced, and many more added.

To prepare for this great demand, the local manufacturers of such equipment and the importers of foreign-made equipment are enlarging their facilities and stocks and soliciting business diligently, all of which will tend to increase the sale and demand to higher standards than existed prior to the earthquake.

Other examples might be cited of the benefits that Japan will derive from the more universal use of electric appliances, but sufficient has been shown to illustrate that this nation, which has staked her future on the development of her greatest natural resource, water power, before many years will be the most perfected example of a completely electrified country. The same super-power system which drives the express trains will supply light and heat to the homes, and cook the food of the nation.

## Britain Invents New Shipbuilding Steel

THE production of a new mild steel for shipbuilding purposes, which has just been announced in England, is of the greatest interest and importance. It is being applied in the construction of two new vessels of the Blue Funnel Line (Holt & Co., Ltd.), destined for Far Eastern trade.

The chief claim for the material is that the plates of the vessels may be made considerably thinner and yet retain the same strength as the plates ordinarily used, and thus it will be possible to build a vessel of given size lighter—any yet able to carry a considerably heavier cargo, with the same engine horse-power.

By the use of this steel a saving of 8.50 per cent. in weight of material will be made, but neither the strength nor the efficiency of the vessel will be reduced in the slightest degree.

The invention, which is causing a great amount of comment in the British metallurgical world, and is being also almost equally discussed in similar circles in the United States, is like so many new and great discoveries, the direct result of an accident. It is the emanation of the brain of F. G. Martin, chief chemist and metallurgist at the head office of the Blue Funnel Line, in Liverpool. Mr. Martin has had the idea in mind ever since the stranding of the Blue Funnel liner *Aeneas* in 1916. He at once proceeded to the scene of the disaster and after testing the plates, used in the construction of the stranded vessel, came to the conclusion that their true elastic limit was, in most cases, too low; the elastic limit being the point to which the plates would stretch and yet return to normal.

In the case of the *Aeneas*, such limit was found to be only 3 tons to the square inch. Mr. Martin became obsessed with the idea that were the elasticity increased to say, 12 tons per square inch the weight of the material would be correspondingly reduced.

On account of the war, it was impossible at that time to do any practical experimenting, and consequently the idea remained in abeyance until 1918. Just at that time a machine was invented by Professor Dalby of London, which materially assisted matters, as it was designed to accurately and rapidly record the elastic limits. This proved the true elastic limit to be approximately 8 tons per sq. in.

Aided by this invention Mr. Martin immediately got in touch with a firm of practical steel makers—David Colville and Sons of Motherwell, Scotland, and between them they evolved a quality of mild steel, which would pass all the required shipbuilding tests and yet provide a higher elastic limit than any previously in use.

The direct result has been, as above stated, the placement of an order for two new vessels which are now in course of construction, in co-operation with the board of trade and all the classification societies, who are insistent on the new steel being thoroughly demonstrated before making any further concessions, since the possibility of Making further increased savings over the 8.50 per cent. already permitted, is the scantlings, is already under discussion.

The vessels, which are being built at Greenock, Scotland, are for the firm's cargo trade, and are 425 feet in length.

The saving of 8.50 per cent. is equivalent to 250 tons in weight, and also adds that amount of space to the vessel's carrying capacity, thus materially increasing the vessel's revenue when full cargoes are carried.

The question of cost is, of course, an all important one. It works out at between 2 and 3 per cent. greater than that of a vessel constructed of ordinary steel, due to the increased manufacturing costs. The compensating advantages, however, are great, and consist of the additional carrying capacity on the same draft and horse-power for the same speed.

Under normal conditions these vessels will be in a class by themselves, and more profitable than any others of similar size and design yet constructed.

The ultimate results are being anticipated with the utmost confidence, and, if successful, as is believed will be the case, expert authorities predict a revolution both in the shipbuilding and the shipping industries.

## A Wicked Canard Scotched

It will be recalled that a report was recently published, to which some newspapers attached flaming headlines, stating that Japan had ordered 140,000 machine guns from the British Vickers Company. The editor of the *Boston News Bureau* sought confirmation of the report and under date of August 22 received a personal letter which he asserts came from "the highest possible quarters in the world." The writer declares that "Japan has not ordered one single machine-gun," and adds: "It is evident that your papers keep the Japanese fire going by always using the bellows."

The sensationalist who concocts and broadcasts a canard like the one referred to, commits a crime against civilization. He is even lower in morality and mentality than the youthful murderers of the Franks boy, whose only explanation for their act was that they "wanted a thrill."—*The Pittsburg Times*.

## The Yue Tung Flour Mill at Shanghai

(Continued from page 548.)

carefully planned system of dust collectors from the danger of dust explosions that occur so frequently in flouring mills.

Outside of the machinery, every device that would help to reduce the manual labor required and economize in the consumption of power has been adopted and it is estimated that flour is being produced in the mill on a basis of 3.75 barrels per horse-power hour.

While it is next to impossible, owing to the variations and market conditions in this class of construction, to arrive at a safe cost basis, an approximate commonly used for establishments of the size of the plant described, including building, power and equipment all installed, is \$160 per barrel. This is based on the cost of construction in the United States. For foreign work a considerable addition would have to be made to this figure, although in some countries this would again be offset by the lower price paid for labor.



# Telephone Reconstruction in Japan

**T**OKYO'S telephone system, all but wiped out in the earthquake and fire of a year ago, will not be restored to its pre-quake basis for another year and a half according to present estimates of the officials of the department of communications.

There were approximately 85,000 telephone subscribers in the capital before the quake and now there are only about half that number of instruments restored. By April of this year, 64,000 telephones were in use and the installation of 24,000 automatic instruments (the contract for which has been let to an English concern) is now taking place.

A glance at the statistics of the earthquake and fire losses sustained by the telephone system will give an idea of the enormity of the task confronting the department of communications a year ago. Out of a total of twenty telephone exchange offices in Tokyo, all but four were completely destroyed in the disaster and the equipment of the four surviving central offices was so badly damaged that it was not restored to use until a month after the catastrophe. Of these sixteen offices wiped out by quake and fire, six have been rebuilt or are nearing completion, being restored on their former sites. The new buildings are of fireproof construction and modern throughout. The rebuilding of the other ten exchanges, however, must await the consummation of land readjustments in connection with permanent reconstruction. The damage to Tokyo's telephone system has been estimated at Y.150,000,000.

At the first violent shock, every telephone in the city was useless and for four days following the disaster, not an instrument was restored to service. Five months after the quake, Tokyo had 18,000 telephones while Yokohama, which boasted 10,000 telephones before the catastrophe, had only 500 in service.

As an emergency measure, the telephone bureau had established by the end of January of this year, thirteen sub-stations in districts in Tokyo formerly served by regular exchange offices.

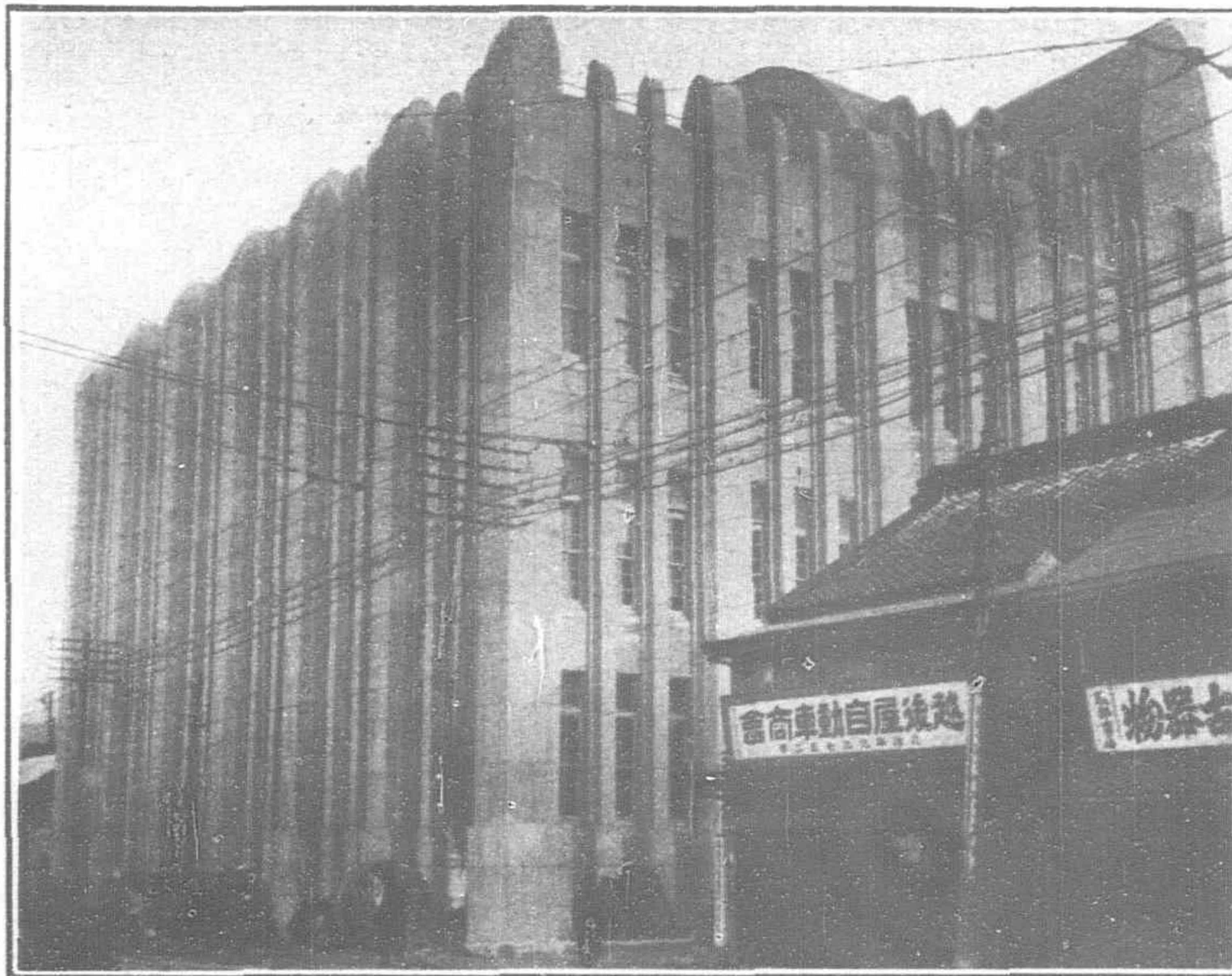
Any group of 200 former telephone subscribers urgently in need of telephones and living within a radius of a fifth of a mile of the site of a former central office, might apply for the installation of such a temporary substation. These temporary stations were operated at pre-quake telephone rates, each subscriber paying an initial fee of Y.300. Sixty-five such stations had been authorized by the first of this year but only thirteen installed.

A further temporary measure taken by the bureau was the establishment of fifteen booth telephones in different parts of the city, each equipped with messengers who would deliver a telephone call to any party living within one-third of a mile of the booth. Fifty such stations were authorized. The bureau also authorized the installation of 500 public telephone booths in different sections of Tokyo to accommodate former subscribers unable to obtain telephones. Of this number 348 had been installed up to October 1, 1924.

In Yokohama where business firms were clamoring for telephones and only 500 had been restored up to January 1, the department of communications granted the first permit ever issued in Japan for a private telephone exchange.

In February, a group of 120 business men established a private exchange in Yokohama with telephone operators and six inspectors. The license was granted for three years with the understanding that it would not be renewed at its expiration.

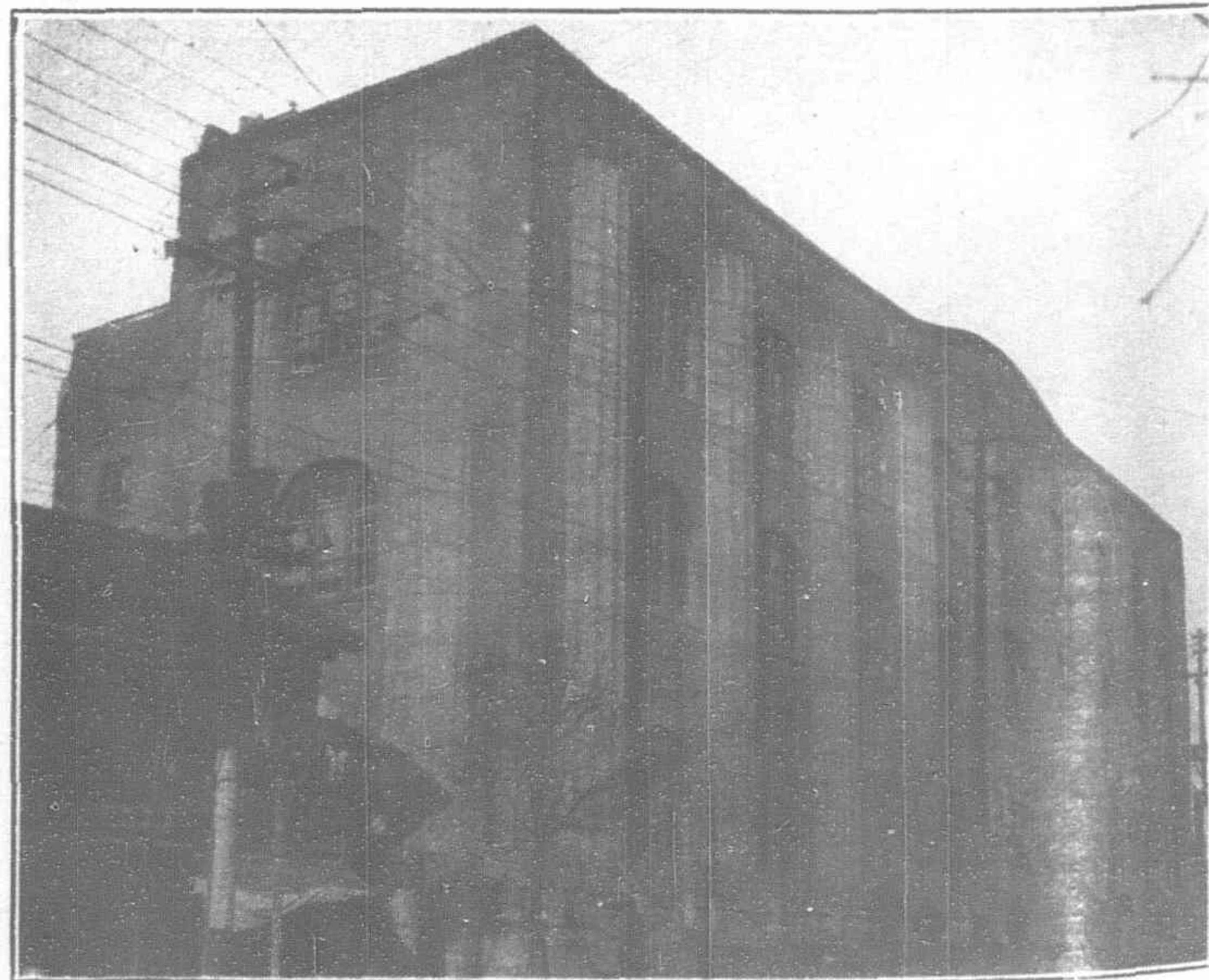
Although the present shortage of telephones in Tokyo is to be attributed chiefly to the quake and fire of a year ago, there were 90,000 applications for telephones on file before the disaster which had not been granted. This does not mean that there were than many firms in urgent need of telephones who were without them.



Ushigome telephone exchange building in Tokyo which was not destroyed by the quake or fire and is one of the most modern central offices in the Capital



Shiba telephone exchange, one of four central offices in Tokyo spared by the earthquake and fire



Aoyama telephone exchange in Tokyo, one of four surviving the quake and fire



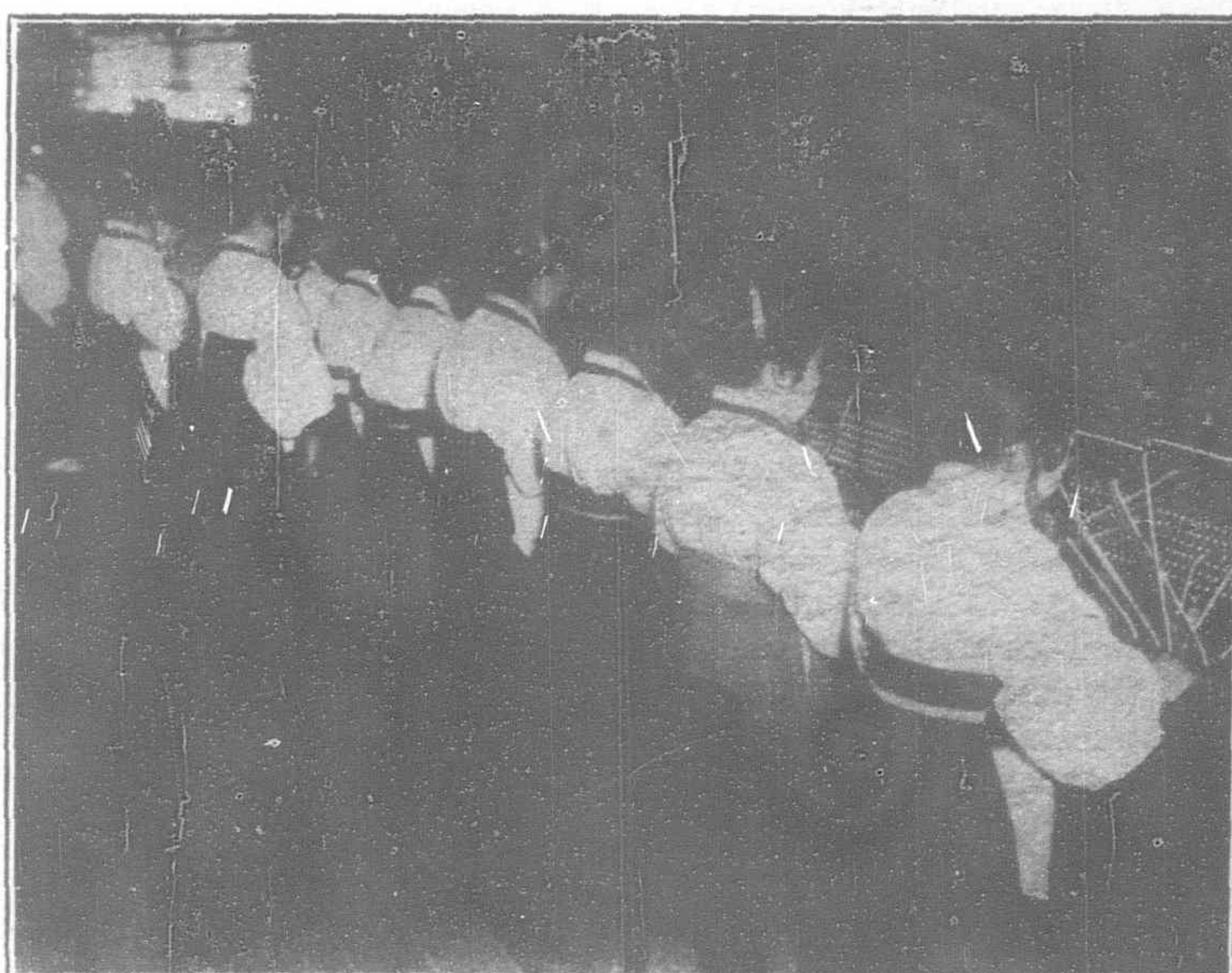
for it was possible by an investment varying from Y.1,500 to Y.2,000 to purchase a telephone from a broker. Telephones are issued by the bureau by means of a lottery system. Each year the bureau granted about 5,000 new telephones and those fortunate enough to draw a lucky number received an instrument for which they only had to pay an installation fee of Y.500 instead of Y.2,000 necessary to buy an instrument from a telephone broker. A telephone is a lucrative investment as long as the bureau pursues the policy of issuing only a limited number of new instruments each year.

After a telephone is obtained, the subscriber must pay a fee of only Y.40 a year and two sen per call to maintain it. A special rate of one sen per call was allowed for a telephone installed in a newspaper building. When a telephone is granted to an individual, he may not dispose of it for a certain period, but at the expiration of this period he may sell it if he sees fit. Buying and selling telephones is a recognized occupation in Tokyo, the individuals thus employed being known as telephone brokers.

According to an American telephone expert connected with the Western Electric Company, the manual equipment used in most of the Tokyo exchanges before the quake was of up-to-date type, comparable to similar equipment used in the United States. The Japanese have patterned their telephone system largely after that of the United States, sending a group of their telephone experts to America every year to study the latest methods in use in the larger cities of the United States.

Japan's telephone system, as has been inferred, is owned and operated by the government, being administered by a telephone bureau appointed by the department of communications. The officials in charge of the telephone system admit that many thousand more subscribers could be obtained if the telephone system could be expanded to accommodate them, but the insurmountable obstacle in the way of expansion is the diet's unwillingness to approve the appropriation of funds necessary to make the present system adequate for the true needs of the capital. The telephone business, far from returning a profit to the government, is a source of loss annually and as now conducted it is not possible to recover the deficit from subscribers' fees. Expansion of the system must come from newly invested capital, not from dividends. Since the system at present is not paying its way, the government is unwilling to promote a greater deficit by authorizing the expansion of the system on a large scale, when the strain on its coffers for reconstruction purposes is already at the bursting point.

The equipment and methods used in a Japanese exchange are not unlike those of a modern telephone central office in the United States except that in most cases the operators are much younger than girls engaged in the same occupation in America. The average age of a telephone operator, according to an official in charge of Ushigome



Telephone switchboard in the Ushigome exchange in Tokyo with operators and supervisors at work

The qualification for a telephone operator in Tokyo is a primary school education. New operators are given three months' work in training quarters on a practice switchboard. Then they received one month practical training at a sub-station, after which they are sent to the residence exchange nearest to their home. After several months in a residence exchange, they are eligible to work in an exchange in the business district.

While in training, their wage is 84 sen per day. After they are placed in regular service, they receive 82 sen a day and a bonus of from Y.3 to Y.4 every three months. The highest paid operators receive about Y.1.20 a day and a bonus of Y.15 every three months.

The operating rooms in Tokyo exchanges are well lighted, heated and ventilated. They are very comfortable in winter but in summer when the humidity in Japan is unusually high, every window in the exchanges must be closed at times, because the moisture in the atmosphere affects the mechanism of the switchboard. On the hottest days, large blocks of ice are sometimes distributed about the operating rooms to make the temperature more bearable.

The Ushigome exchange, one of those of fireproof construction not destroyed a year ago, has a lunch room for operators on the second floor and a large dormitory on the first floor. The operators who begin work at 2 o'clock in the morning come to the exchange at 6 o'clock in the evening and sleep in the dormitory until they are called to duty. The dormitory in this exchange will accommodate 80 girls. When the operators who finish their shift at 2 a.m. get off duty they sleep in the dormitory until morning when they return to their homes. The hour just preceding bedtime in these telephone exchange dormitories is looked forward to with great anticipation by these child operators who make it an occasion for playing games and various forms of recreation.

On the ground floor of the exchange is a large Japanese bath.

Compared with the efficiency and excellence of Japan's government owned, and operated railway system, government ownership of her telephone system is not an unqualified success.



Operators "standing" for a rest while at work at a switchboard in Ushigome exchange. It has been found that a few minutes standing is beneficial to the operators though they sit down to their work most of the time



# Japan's Coal-tar Chemical Industry

**T**HE coal-gas industry of Japan is the sole domestic source of crude coal-tar materials. In fact, it is because of the by-products such as coal tar, coke, and ammonia, that the gas industry, in competition with hydro-electric power, owes its existence. Approximately 500,000 *koku*\* of coke and 160,000 *koku*\* of coal tar are produced annually from the gas industry, which makes clear how essential it is that the coal-tar chemical industry be fostered. Hence, the government in its endeavor to propagate and protect this branch of the chemical industry, inaugurated a subsidy action June 21, 1915, embracing the manufacture of crudes, intermediates, dyes, drugs, and explosives.

As in many other countries, the manufacture of dyes is considered a "key industry" by Japan and has been subsidized for more than Y.9,500,000 in the past seven and one-half years. During the war Japan had over 100 factories engaged in this industry representing an investment of Y.20,000,000. During that period the government organized the Japan Dye Manufacturing Co., in Osaka, with a capital amounting to Y.8,000,000, with control exercised through the bureau of industry, department of agriculture and commerce, Tokyo, and the home production grew under the guardianship of the government. After the war the importation of foreign dyes became active again and the companies have been unable to make any profit, notwithstanding the high protective duty, and hence the government has been compelled to make good the loss. The Japanese concerns have been successful in their experiments with over 80 kinds of dyes. The majority (86 per cent. of the total) made by the Japanese are sulphur colors, particularly sulphur black, and these are her best colors. In fact, three or four of these sulphur dyes are of superior quality. Rhodamine, a few alizarines, direct, basic, and acid dyes of the primary color type are also produced.

In 1919, the peak year of production, it is estimated that the dye factories of Japan produced over 16,000,000 pounds of dyes. The factories suffered, however, from a lack of intermediates and a shortage of skilled workmen, although almost any common dye of commerce could be produced by the Japanese factories in their laboratories. They have been unable, however, to produce the higher and finer types of dyes in commercial quantities and at competitive prices. This condition, which has resulted in a flood of imported colors, has also been reflected by the decline in Japan's production figures. At the present time there are only two dye factories operating on a large scale in Japan—The Japan Dye Manufacturing Co., Osaka, and the Mitsui Mining Co. There are no figures available as to the quantity of crudes produced, but some indication may be arrived at on the basis of the quantity of coke and coal tar produced annually. In the case of intermediates, however, there is no indication as to the quantities produced, except that which might be estimated from a study of the amount of coal-tar dyes and drugs produced and the added information afforded by the country's exports and imports of crudes and related products. In both cases, however, Japan's production, particularly as to crudes, is inadequate to meet its demand.

The future of the entire coal-tar processing industry, as reflected by statistics and large financial loss, looks extremely dubious, yet the government considers it essential and, according to the Japanese press, will continue to foster, subsidize, protect, and furnish requisite technical assistance until the industry is independently established, at least in connection with basic processing.

An acknowledged condition such as this may offer opportunity to American manufacturers who are aggressive enough to cultivate the market in competition with other nationals. The market is steadily growing and the foreign product is obtaining a more extensive and more stable hold.

## JAPANESE DYE PRODUCTION

Classes	1921 Kin	1920 Kin	1919 Kin
Direct colors	299,871	209,304	421,521
Basic colors	350,195	275,452	245,115
Sulphide colors	8,002,195	5,034,535	10,682,836
Acid colors	90,048	109,340	155,336
Acid mordant colors	6,959	10,212	...
Mordant colors	128,544	65,017	...
Vat colors	72,909	200	...
Miscellaneous colors	579,623	356,614	945,034
Total	9,530,344	6,060,674	12,449,842

Note.—One *kin* equals 1.32277 pounds.

## Exports

In 1921, the first year of record, Japan exported 49,000 piculs of coal-tar dyes (representing 5 per cent. of the total production), of which 48,653 piculs went to China. The total exports for 1922, however, dropped about 9,000 piculs. Coal tar and pitch exports rose from 46,000 piculs in 1919 to almost 89,000 piculs in 1922. China and the Dutch East Indies have been the principal purchasers. Most of the Japanese export of naphthalene goes to China. The coal-tar products situation has been fairly well outlined in the comments on Japanese production and imports.

## JAPANESE EXPORT OF COAL-TAR PRODUCTS

Classes	Value							
	1922		1921		1920		1919	
	Total States	United States	Total States	United States	Total States	United States	Total States	United States
	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
	yen	yen	yen	yen	yen	yen	yen	yen
Coal-tar dyes	1,975	1	3,357	...	...	...	...	...
Coal tar and pitch	633	...	153	...	459	...	252	...
Naphthalene	57	...	65	...	300	157	217	...
Total	2,665	1	3,575	...	759	157	469	...

## Quantity

Classes	Total*	United States	China and Kwantung	Hong-kong	British India	Dutch East Indies	Straits Settlements
Coal-tar dyes:	Piculs	Piculs	Piculs	Piculs	Piculs	Piculs	Piculs
1922	40,358	...	...	...	...	...	...
1921	49,043	...	46,035	2,618	61	254	28
1920	...	...	...	...	...	...	...
1919	...	...	...	...	...	...	...
Coal tar and pitch:	Piculs	Piculs	Piculs	Piculs	Piculs	Piculs	Piculs
1922	88,926	...	...	...	...	...	...
1921	26,072	...	22,963	...	...	2,611	...
1920	84,981	...	12,588	15,894	1,300	21,358	...
1919	46,206	...	28,883	185	...	8,233	...
Naphthalene:	Piculs	Piculs	Piculs	Piculs	Piculs	Piculs	Piculs
1922	2,460	...	...	...	...	...	...
1921	2,593	...	1,516	417	110	173	169
1920	12,875	7,179	3,472	313	819	343	147
1919	8,966	...	5,993	340	1,199	77	345

Note.—There were no exports to Great Britain, France, or Germany during any of these years.

\* Complete detailed figures by countries for 1922 are not available; blanks, therefore, following the total for that year do not necessarily mean that no trade was carried on with those countries.

## Imports

In 1919 the United States supplied over 60 per cent. of the value of Japan's importations in this group, which embraces crudes, intermediates, and dyestuffs materials. In 1920 the value of these imports increased approximately 40 per cent., and the quota of the United States amounted to approximately 60 per cent. While the value of importations remained approximately the same in 1921, the share of the United States was but 16 per cent., the loss occurring in aniline dyes, wherein we supplied but one-sixth of that of the previous year. The total for the year 1922 indicates (from United States sources) that the United States supplied but one-sixth of that of the year 1919 and approximately one-half of that

\*The *koku* equals 47.95389 United States gallons, or 5.11902 United States bushels (dry). 93545—24—3.



of the year 1921. While this country maintained the same position as of the previous year in the supply of aniline dyes, yet the quantity of crudes and intermediates, according to United States export statistics, had decidedly fallen off. It is interesting to note the steady increase in the quantity of artificial indigo imported by Japan through the period 1919-1922. This product is gradually displacing the natural indigo.

*Carbolic Acid.*—In the field of crudes, as represented by carbolic acid, the United States and Great Britain obtained about equal proportions of the trade in 1919 and 1921. In 1920, however, Great Britain obtained two-thirds of this business, while in 1922 it had increased to three-fourths. Were the sources of crude coal-tar products in the United States to place in operation such plant facilities as would render maximum production, however, this country would be in a position to be the strongest competitor in the far-eastern market. At present even the United States has been a good customer of Great Britain in crude and semi-processed coal-tar basics. This serves to illustrate an instance in which much constructive work may be done by prospective exporters and other consumers toward educating potential producers in the United States along the line of conservation of crudes.

*Aniline Oil and Salt.*—This commodity, which has been taken as representative of the intermediate group, demonstrates the possible supremacy of the United States in the field of intermediates.

Following the post-war period to the close of the year 1921, the United States enjoyed the bulk of this trade. In 1921, however, Germany obtained over 25 per cent. of the business.

*Aniline and Other Coal-tar Dyes.*—The import market for dyestuffs in Japan has been increasing yearly, and from approximately 21,000 piculs in 1919 importation has increased to 70,000 piculs in 1922. In the initial year the United States obtained 75 per cent. of this business and approximately 66 per cent. in 1920, but in 1921 the participation of the United States amounted to but 15 per cent. current indications relative to the year 1922 (from the United States record of exports to Japan) are to the effect that our quota was not materially strengthened but, in fact, declined to 10 per cent. of Japan's total importation of this class of products.

In 1921 Germany, which during the war and prior to that year had been a negligible factor, received 75 per cent. of the business. Although Germany's position was materially strengthened, it is still not comparable with that country's pre-war position, and has been regained through the medium of price cutting and other measures.

German products have been aided to an appreciable extent by the good will and standard trade-marks with which the Japanese became familiar in pre-war years, coupled with the practice in vogue in all countries of standardizing samples against the pre-war German product. The combination of these factors with the attempts of all other dye-producing nations to compete with the German product in that market has practically destroyed the subsidized and partially protected independent dyestuff manufacturing industry in Japan. In fact, the well-established and powerful textile manufacturing industry of Japan has been favorable to products of foreign origin, from the standpoint of competitive price and quality.

It is encouraging to note that the United States has continued to maintain a fairly strong position in this market, regardless of the fact that it is an open one wherein none of the competing countries are favored by agreements, tariffs, or other regulations. This alone serves to indicate how well developed the dyestuffs industry of the United States has become. The fact that the United States has enjoyed the bulk of the market in Japan up to 1921 has served to acquaint Japanese merchants with the comparable quality of American products. The present time is, therefore, most opportune for further extension and development. An important phase to consider is that before the world war commenced in 1914 the United States was obliged to import about 90 per cent. of its intermediates and finished products, whereas domestic production now enables it to supply 93.5 per cent. of its own consumption and still to be able to export. The present line of development points to a strong possibility that the United States will soon produce larger quantities for export. As stated above, it is necessary to cultivate and develop good will quality standards abroad which will tend to place American dye exports on at least an even footing with those of the most formidable competitor, namely, Germany. The attainments of the American dye industry show that it has been marching forward at a rapid pace. The logical assumption is there-

fore that American production, which will soon greatly exceed domestic demand, must strongly enter the export field. With increased production should come lowered costs, and a natural consequence would be a lower and more highly competitive selling price in far eastern and other world markets.

While Germany has re-entered the Japanese market quite strongly still Germany's position in connection with available supplies of crudes, labor conditions, etc., is such at the present time that the American industry has less to fear from Germany in that connection than in the past, and there is no reason why the United States should not eventually be the major supplier of these commodities in the far eastern market. Finally, the hope of the Japanese to supply their consuming demand will not meet with very great success, even in the future, because of the fact that while formulas and methods are a matter of common knowledge, technique has not been acquired by the Japanese in a degree sufficient to afford the the United States strong competition from Japan's domestic production. The tendency of the Japanese is to concentrate more upon commodities involving the cruder processes of manufacture. Commodities which involve a high degree of technique or technical knowledge will for many years be controlled by the occident.

*Artificial Indigo.*—In connection with indigo, one point at least should be brought out. Natural indigo represents at present but one-third of the total quantity of indigo by Japan. Obviously, the United States has not exported any natural indigo to Japan, that being a commodity which is native to British India. Recent reports show, however, that the tendency to cultivate indigo in India has greatly lessened, and that the great acreage developed by war exigencies is now being discontinued owing to the abundance and the superior quality of artificial indigo. Japan's importation of the natural products declined 80 per cent. in 1922 as compared with that of 1920. In 1921 Germany was the principal supplier of artificial indigo in the Japanese market, approximately 66 per cent., followed by France as a very poor second, and the United States as third with 10 per cent. This artificial dye, representing approximately 25 per cent. of the synthetic dyes imported during the past two years, should certainly be made the principal point of attack by American producers. While the mark exchange may have been an added factor in Germany's favor in 1921, other conditions in Germany which have developed since that time are undoubtedly operating against that country's effort. If American products should be strongly pushed in Japan, a good will might be developed which could be displaced only with great difficulty by any foreign competitor.

It is a well-known fact that many foreign countries, especially European countries which have been for years engaged in a large foreign trade, have, through the assistance of their own carriers, set up and maintained well-organized import and export positions. As the result of such organization they have been able to present a unified front both in the sale and purchase of materials. Such organization has been of inestimable value in rendering the most favorable quotations on the import and export commodities. The German dye cartel is the most conspicuous example of an organization which has been effective in developing efficient methods of production, which in turn permitted the lower selling prices, and through close centralized control and affiliations has rendered such an organization a formidable competitor in any foreign country which it enters. This result is particularly pronounced in Japan.

*Other Chemical Products Derived from Coal-tar Distillates.*—During 1922 products under this classification valued at ¥1,148,000 were imported into Japan. Japanese statistics do not show the value of this material received from the different countries for that year, but United States export figures show that this country accounted for practically 70 per cent. of this group. In 1921, however, when the value reached ¥953,000, the principal countries of supply were Germany and the United States, in the order named, the former approximating 55 per cent. and United States sales aggregating about 40 per cent. of the total. Great Britain shipped but a very small amount. This classification is very general, and in Japanese statistics no doubt includes a great number of coal-tar crude products. This is one field in which American exports could be greatly increased if the producing industries could be taught the value of conservation. The field throughout the world for coal by-products is practically unlimited. The enormous increase in consumption in recent years is merely an indication of the great demand which may be fostered through the medium of education

(Continued on page 523.)



# Tiffin-Time in Manila

## A REVIEW

The United States and the Philippines, by D. R. Williams, published by Doubleday, Page & Company, New York

**A**NOTHER book on the Philippines. This time, however, it is a welcome contribution to one of our greatest problems and the public gets a survey of the facts from a man eminently qualified to treat the subject intelligently. Twenty years experience in the islands, at one time officiating as secretary to the Philippine commission, as judge of the land court and holding other responsible positions, Judge Williams may safely be accepted as an authority whose views may not be lightly challenged or set aside.

The purpose of the book is to sound a warning against conceding independence to the islands at this particular time of international political unrest, believing that acceptance of the Filipino plea would constitute a repudiation of obligations deliberately assumed by the American people. Judge Williams sees a crisis in our relations with the Philippines rapidly approaching and on the right decision of the American people hinge not only the progress and well-being of ten millions of Filipinos and their descendents but also the prestige of the United States and the part it is destined to play in the titanic struggle now shaping for trade supremacy in the awakening Orient.

In arriving at his conclusions, Judge Williams carries us through the intricacies of our entrance into the Philippines, down through the various administrations to the present time and in the two final chapters makes a brilliant summing up of the facts to support his thesis. In our opinion the book will stand as the best that has been written on this highly controversial subject. In nearly every point and conclusion it will be difficult to reverse his findings. Unfortunately, in order to strengthen his arguments, Judge Williams so far forgets his judicial character as to accept at their face value the stock arguments about Japan's designs on the islands as one of the reasons why America should hold on to them.

Judge Williams argues that the territories and possessions of Great Britain, France, Holland and the peoples of Australia and New Zealand would be vitally menaced by a Japanese dominance of Philippine resources and strategic bases and they would assuredly seek to forestall such consummation. After devoting several pages to the possible menace of Japan to an independent Filipino republic, he destroys his argument in one sentence: "*The situation was summed up,*" he says, "*by a somewhat cynical British naval officer in Hongkong, who remarked that if the United States gave up the Philippines, 'the Japanese will be in there by tea-time,' to which he added, 'The British, however, will be in there at tiffin-time.'*"

If coming events cast their shadow before, the tiffin-party would seem to be more of a certainty than the five o'clock ceremony, an eventuality brought measurably nearer by the construction of the Singapore naval base. The popular acclamation of the British project by the jingo press of America who see in this move a way to circumvent the provisions of the four-power treaty has not passed unnoticed in Japan, France or Holland. The Singapore base may be designed for the sole defense of the British possessions against any southern expansion of Japan, but it will be difficult to convince France that this is the sole reason.

The present conflict of policies in Europe may at any time align Britain and France on opposite sides of the fence, in which case a British naval demonstration based on Singapore would not only end French rule in Indo-China but settle for all time the conflict of interests in Siam. The whole of south-eastern Asia would then fall under British influence. It is little wonder the report persists that Japan and France have come together in some sort of an understanding to offset this menace.

The real reason for the establishment of a great British naval base at Singapore is not so much a fear of Japanese aggression as it is the uncertainty surrounding the permanence of American rule in the Philippines. The high board of strategy sitting in London reads and interprets correctly the handwriting written large upon

the wall, and is satisfied that the day is not far distant when American authority will be withdrawn from the islands. As soon as the democratic party comes into power, the American flag will be hauled down. This ceremony may be deferred four or even eight years, but it will come. The democratic party is too far committed along these lines to retract. Keeping this possibility always in mind it is much easier to understand what is going on at Singapore and get the correct angle on that nice little tiffin party in Manila Bay. When American writers so far forget the rudiments in the game of imperialism as to urge that we remain in the Philippines in order to guard British possessions in India, Malaya and Australasia against possible Japanese aggression, it must excite the risibilities of a nation of men who jolly well know their own game and how to protect their own interests.

Judge Williams quotes William Howard Gardner who holds that our decision over the future of the Philippines has an equal influence in deciding the future of the Netherlands East Indies and Australasia to say nothing of the future of India, of Malaya, of China and of all for which our civilization may stand in the Orient. In short, the American, the British and the Dutch circles concerned with matters of international grand strategy in the Far East recognize explicitly that the guard the United States mounts at the Philippines is essential to the security of Australasia and to whatever measure of peace may be maintained "east of Suez."

In taking this stand, both Judge Williams and Mr Gardner are repeating arguments originally advanced by THE FAR EASTERN REVIEW in its article entitled "The Keys of The World," published in April, 1921. These conclusions are sound, advanced at a time when conditions in the Pacific were different from what they are to-day. In accepting this argument as an important phase of the Philippine question, the American people are being asked to constitute themselves the guardian of British and Dutch interests in Eastern Asia and Australasia against the possible menace of Japan. The average high-minded American will cheerfully admit and accept to the full his direct responsibilities to the Filipino people but if this obligation implies that he must also stand as the bulwark of European imperialism against Japan's legitimate aspirations to exist within her own sphere and shoulder the task of confining her people in a water-tight compartment for the advantage of Great Britain and Holland, then he may well begin to open his eyes and ask where all this is leading to.

If our experiment in the Philippines is to place us squarely across the path of Japan as the pawn of Europe in a part of the world we have entered solely to elevate a backward people to our level of civilization, the sooner we repudiate these obligations and get back to firm ground the better it will be for everybody. There are altogether too many points of contact between the United States and Japan. Our China and Siberian policy has driven Japan into Manchuria to make her last stand for the right to exist and it hardly becomes us as a peaceful and just nation to expose ourselves to the charge that we are wilfully driving this heroic people to desperation by declaring in so many words that our continued presence in the Philippines is a challenge to their expansion southwards. Some day, Japanese and Chinese will enter the Philippines on a plane of equality with other peoples. That day, perhaps, may mark the end of Filipino economic independence but it will constitute no more of a menace to the political independence of the islands than the present tendency of British or American commercial expansion.

The words of the British naval officer quoted by Judge Williams tell us that there is another side to the question of Filipino independence and by implication says that not only must the United States stand as the buffer against possible Japanese expansion southwards but by the same logic we must guarantee that Japan will never be attacked from this quarter. European propaganda is steadily goading us along a road that can



end only in disaster. We have already constituted ourselves the protector of China and the policeman of Siberia and Manchuria in addition to guarding the Philippines, and in every way possible we are being pushed across the path of Japan by skilful diplomacy and relentless propaganda. And the unsophisticated American quietly accepts a situation that will draw down on him the solution of problems in the Pacific which should be settled in central Asia, where they belong. Every move we make in China strengthens the hand of Russia in Asia and her implacable determination to ruin Japan and now we cheerfully permit those who advocate retention of the Philippines to tell us that we must remain in the islands to protect Great Britain and Holland against Japan.

Judge Williams falls into the common error of accepting at its face value the statement that the islands are not costing the American people anything for their upkeep. What are the facts, he asks, and then goes on to quote the secretary of war who testified that the only saving to the treasury through abandonment of the islands would be the present upkeep of the Philippine scouts, about \$2,000,000 per annum. He then turns to the credit side of the ledger and itemizes the vast undeveloped natural resources of the islands, overlooking that these must remain a liability instead of an asset as long as the laws are so framed as to prohibit their development. He points to the advantages accruing to American trade from our occupation of the islands. In 1923 this trade amounted to \$132,000,000 or 65 per cent. of the total—of which, about \$50,000,000 represented the value of American exports to the islands under a free trade system, which since 1909 has given Americans this advantage over their competitors.

In a previous chapter Judge Williams admits that all Philippine products imported into the United States could be just as well imported from other tropical countries should the Philippines be unable to meet the resulting competition when called upon to pay duty, which implies that the United States is not dependent upon the Philippines for these products. They can be obtained as cheap or cheaper elsewhere. He then states that the advantage accruing to the Philippine producers of sugar, coconut, oil, tobacco, embroidery, etc., through free trade with the United States amounts to \$40,000,000 annually.

This means that the United States treasury is remitting \$40,000,000 annually in duties on products that can just as well be purchased from other sources and at a lower price and this sum employed to wipe out our war debt. However, we prefer to present this sum to the Filipino in order that we may export \$50,000,000 of manufactured American goods on which the profits will not average more than five per cent., a total benefit to the nation of \$2,500,000. Now, the revenues of the Philippine government amount to about \$33,000,000, so if figures do not lie, the fact would seem to be firmly established that the American people are called upon to pay out indirectly \$40,000,000 for the benefit of insular industries in order to create a fictitious prosperity that enables the insular government to collect the \$33,000,000 required to maintain itself. Now there may be some rule of logic that can explain away the statement that the islands are not costing us anything, but it is difficult to explain the difference between a direct subsidy of \$40,000,000 voted by congress annually for maintaining the Philippine government and an indirect subsidy of the same amount camouflaged behind tariff exemption which accomplishes the same purpose.

Judge Williams recognizes these facts when he says that "with the principal industries of the islands paralyzed or sorely stricken through denial of our markets, and the masses of the people reduced to the poverty and misery of Spanish days, the reaction upon public revenues would be immediate and disastrous." He admits that in consequence of American occupation and free trade, wages are double and treble those paid in Spanish times and the scale of living much higher than in other Oriental countries. In effect, wages in the Philippines are in reality about ten times higher than in China or Indo-China, Siam and Malaya. Judge Williams corroborates in part the statement emphasized in the October number of THE FAR EASTERN REVIEW when he says: "This fact, coupled with their natural proclivities, would render it difficult if not impossible for Filipinos to meet on even terms the cheap labor of China, Japan, Java and other countries whose products would come into competition with those of the Philippines." Judge Williams is wrong about the wage rate in Japan, but that is another story. It would be easy enough to use the evidence of Judge Williams to support that of Mr. Renton Hind and prove

that the only tangible result of our charity in remitting \$40,000,000 a year in duties on Philippine products has been to maintain the Filipinos in a state of arcadian idleness from which they rouse themselves to give one hour of their time in exchange for the full-day wage this charity on our part enables their employers to pay them. That we have not slandered the Filipino people or presented a distorted picture of the real situation, is borne out by an interview with Mr. Pardo de Tavera recently published in the *Philippines Free Press*. Mr. Tavera was a member of the first Philippine commission, one of the foremost leaders of his people. In effect, he advocated the passage of laws that would compel the Filipino to work, reverting unconsciously to the system employed by the Dutch to get an honest day's work from the Java Malay.

When, in addition to paying out \$40,000,000 a year for the privilege of running a government whose expenses do not exceed \$35,000,000 and maintaining an ungrateful people in comparative idleness, Americans are told that they must stand as the guardian of India, Australia, New Zealand and the Netherlands East Indies against the possible expansion of Japan to the south, it is rubbing it in a little too thick.

If this conception of our duty is to prevail, the traditional caricature of Uncle Sam may as well be redrawn, depicting the kindly old gentleman on all fours with a pair of horns protruding through his high beaver hat, and a marcel wave to his chin-whiskers, giving him his proper label—The International Goat.

## Japan's Port Works Appropriations

A program of ports and harbor construction for the coming fiscal year will have a total fund to draw on of Y.9,372,000.

This was announced, when it became known that the government has set aside Y.5,115,000 in its appropriations totaling Y.151,515,687 for the next year's expenditures. The remainder of the total fund is to be derived from local governments.

The proposed plan of general improvement and reconstruction work in Japan's ports and harbors lies within the jurisdiction of the department of home affairs. While a larger program had been tentatively planned, this fund will enable much to be done.

The plan to improve Komatsushima port will have to be postponed for the time being. However, many other places will be completed by the appropriation to be available during the coming year.

### Table of Ports

A table of the ports now under construction and the funds appropriated for those to be finished follows:

	Percentage of work done.	The sum for the fiscal year 1925.	The sum appropriated by Government.
Improvement of			
Kwanmon Strait ..	84	Y.750,000	Y.750,000
Yokohama ..	47	2,500,000	2,500,000
Shiogama ..	71	300,000	—
Niigata ..	92	215,000	—
Kobe ..	56	2,200,000	1,090,000
Moji ..	67	450,000	450,000
Nagasaki ..	79	229,000	—
Yokohama ..	47	2,500,000	2,500,000
Shimonoseki ..	40	400,000	240,000
Shimizu ..	56	847,000	85,000
Sakai ..	25	280,000	—
Takamatsu ..	49	400,000	—
Tsuruga ..	13	350,000	—
Imaharu ..	11	150,000	—
Komatsushima ..	3	—	—
Kagoshima ..	7	200,000	—
Yokkaichi ..	87	796,000	—
Nagoya ..	80	1,690,000	400,000
Nawa ..	83	245,000	150,000
Funakawa ..	72	320,000	—
Osaka ..	86	1,304,000	—



# The Chinese Telephone System in Shanghai

By K. Rothe, Engineer-in-Chief, Chinese Government Telegraph Administration, Shanghai District



ANY people, when speaking of Shanghai, think only of the international settlement and French concession, and even among those who themselves reside in Shanghai not a few are found who never go near the "city" and think of Nantao and Chapei, as they were before the revolution and do not realize the big strides towards modernization which in spite of all difficulties have been made in these districts in recent years. There is, it is true, yet a long way to go before really modern conditions are reached, but conditions are in fact not so far behind those found in the "Model Settlement."

One of the sure indications of the development of a city is the state of its telephone system. The Chinese telephone service throughout the country like other branches of communication in China, develops slowly, but nevertheless steadily and surely. It may perhaps even be better for the service that it develops quietly and without much notice and though its officials and engineers are often on the verge of despair because of the difficulties, financial and otherwise, which beset the service and the obstruction placed continually in the way of expansion; the service manages slowly to force its way towards its goal—telephone intercommunication within the reach of everybody in the country.

The exchanges in the Shanghai district labor under special difficulties created by the fact that, in spite of negotiations begun more than twenty years ago (when the writer was assistant in the Shanghai Mutual Telephone Co.) arrangements have not yet been made for intercommunication with the exchanges in the foreign settlement, so that telephonically the Boulevard des deus Republiques and other "boundary roads" might, except for a few direct subscriber lines owned by the Mutual Telephone Co., be as wide as the Pacific Ocean—truly an abnormal situation in a great commercial city like Shanghai; and also because toll lines to other important centres like Soochow, Wusieh and Nanking—let alone Hankow, Peking and Tientsin—have not yet been built (although long ago decided upon and the necessary materials bought), on account of obstruction by certain influential bodies. One wonders how long the local population will quietly submit to such conditions.

In spite of these difficulties, which prevent normal expansion, the adminis-

tration three years ago opened a fully modern central battery exchange serving the city and Nantao district, while the smaller exchange in Chapei is yet worked on the magneto system general in Shanghai. The two exchanges are connected by trunks which run a distance of 10 miles all the way along the west side of Siccawei creek past Siccawei village and along the railway to Markham junction where they join the Chapei cables, a most unsatisfactory arrangement, but one which under existing circumstances cannot be altered. During the recent disturbances the Shanghai Mutual Telephone Co. did, however, show the sister service the courtesy of kindly permitting, for a nominal fee, the use of some of its cablewires for temporary emergency trunks through the settlement. From Chapei exchange two trunks run to Chenju and two to toll lines in Nanziang. In Chenju is a small private exchange subscribed for by the college. In Nanziang the administration has a small public exchange worked on the magneto system.

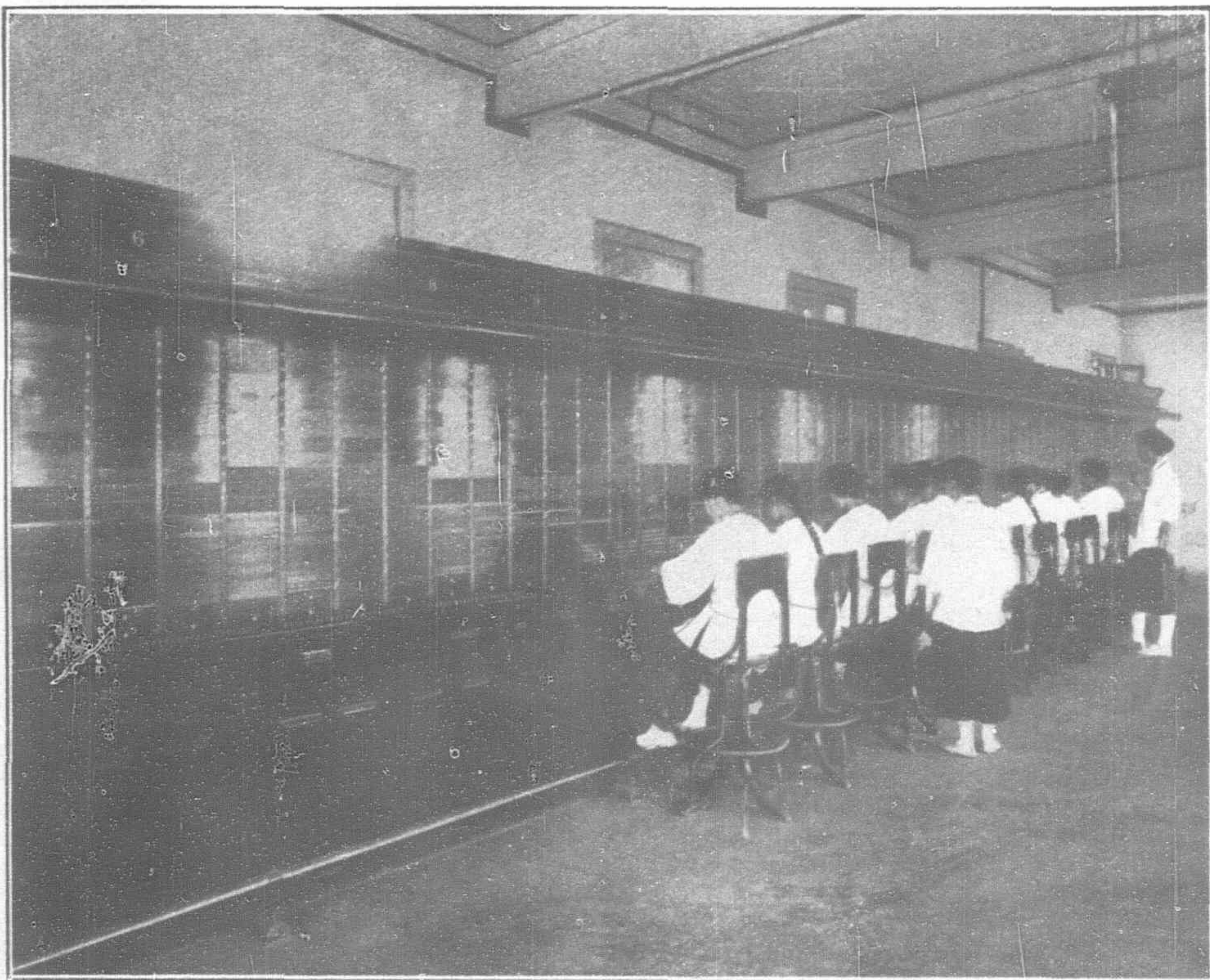
The *Nantao Exchange*, from which the accompanying photos are taken, is housed in a substantial three-storied building, constructed of brick, with floors and staircases of reinforced concrete. The building is situated on the Chung Hwa Road, the broad boulevard constructed on the site of the old city walls, near the South Gate. The equipment, which was delivered by the China Electric Co., is of Western Electric manufacture. In the upper story, which is taken up by the switchroom and waiting rooms for the operators, the local and toll switchboards are placed. The local switchboard of W.E. central battery, multiple relay type, has a present capacity of 2,000 lines and an ultimate capacity of 8,000 lines. Eight "B" positions accommodate the 150 incoming trunks and 26 "A" positions the present 2,000 local lines. The toll board, as yet not in use, is at present equipped for 10 toll lines 20 toll switching trunks and 30 recording trunks.

The operating staff is all female, with Chinese ladies as supervisors and chief operators. Each operator serves 120 lines and works normally six hours a day divided into two shifts. The traffic on account of the special circumstances limiting the service, is very low for China—while in Tientsin and Peking 25 calls per line per day is usual, in Shanghai the calling rate is only 8.

On the second floor is found the test and



The Chinese Government Telephone Exchange in the Chinese City of Shanghai

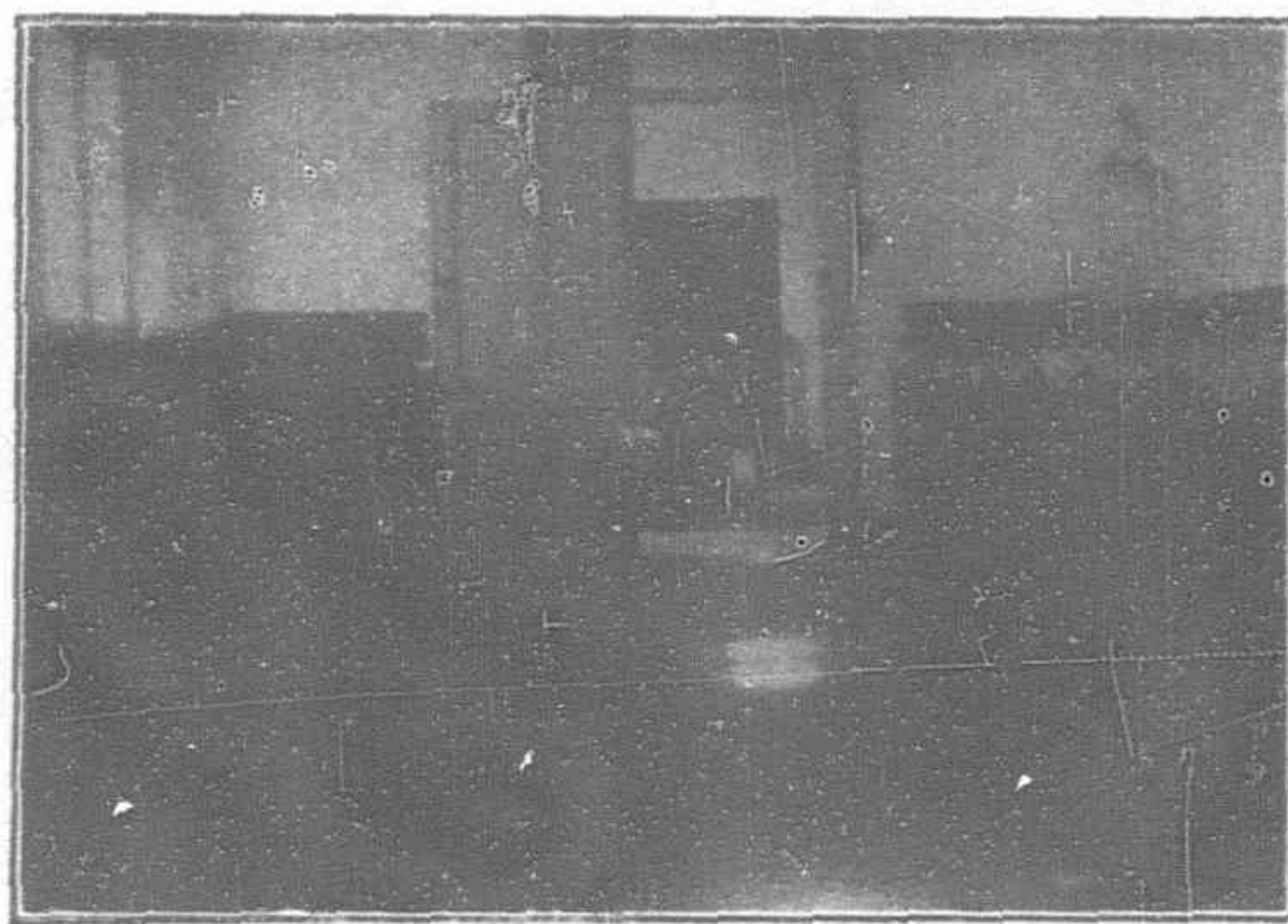


Switchboard in Chinese Government Telephone Exchange, Shanghai

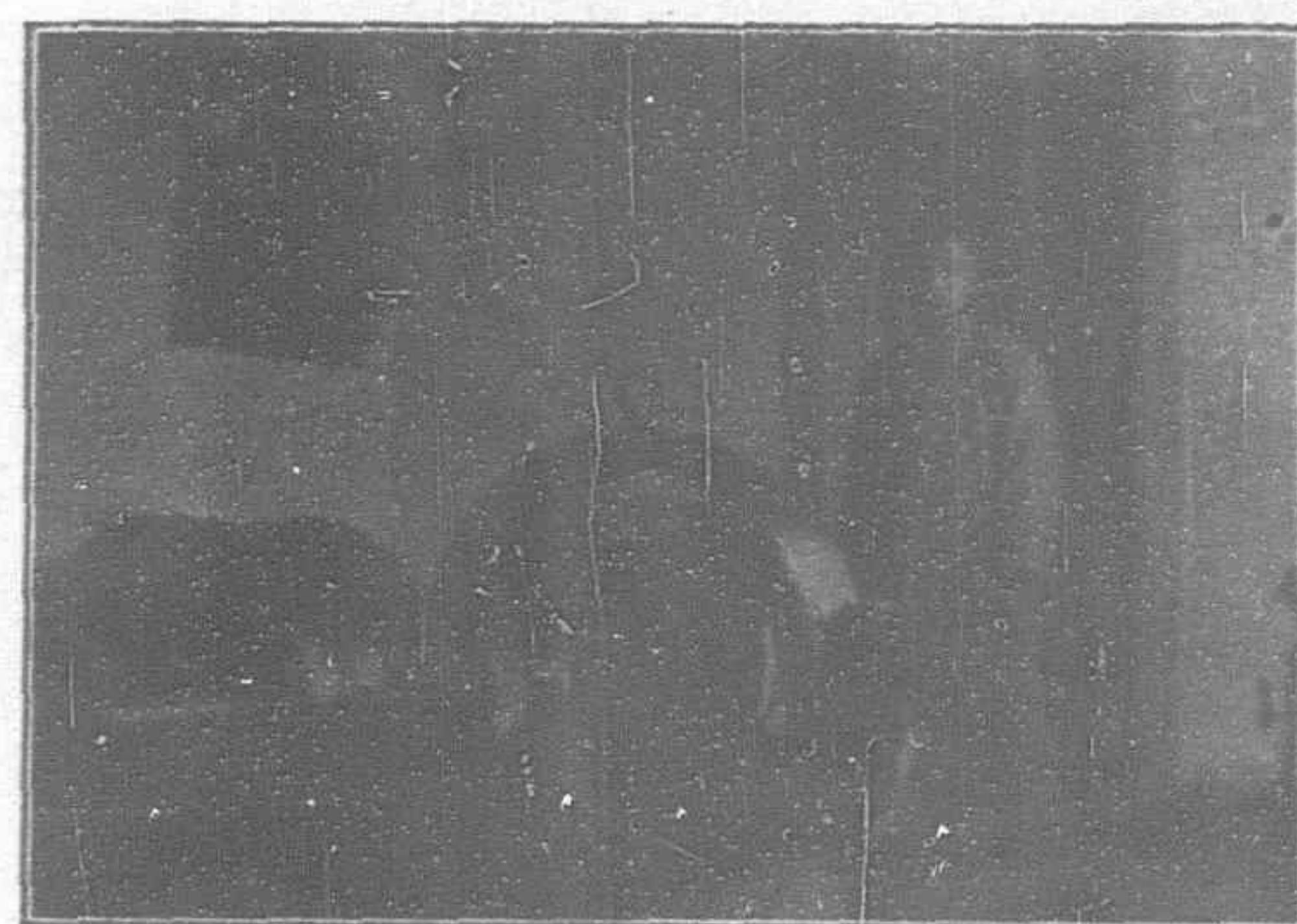




Test Desk



Battery and Power Rooms



Charging Motor-Generator

distribution room, the power room, the battery room and the offices for the engineer departments, while on the ground floor is the office of the general manager, the chief accountant and the general office as well as a reception room.

The distribution frames and equipment are of the usual type for C.B. work. All through the equipment enamelled wire is used.

The M.D.F. is equipped with 3,000 protector pairs, to which the underground cables are directly connected. The I.D.F. is equipped for 200 lines. The relay rack with 2,000 line and cut off relays type W.E.A. 1 and 2 and the necessary relays for trunking and toll service. Behind this rack is the coil and condenser rack and the fuse board, fitted with fuses with visual and audible alarm. The wire chief's desk is fitted with all necessary keys, jacks and instruments for testing purposes.

The batteries consist of two sets of choride accumulators each of a capacity of 1,200 amp. hours (tank cap. 2,400 A.H.)

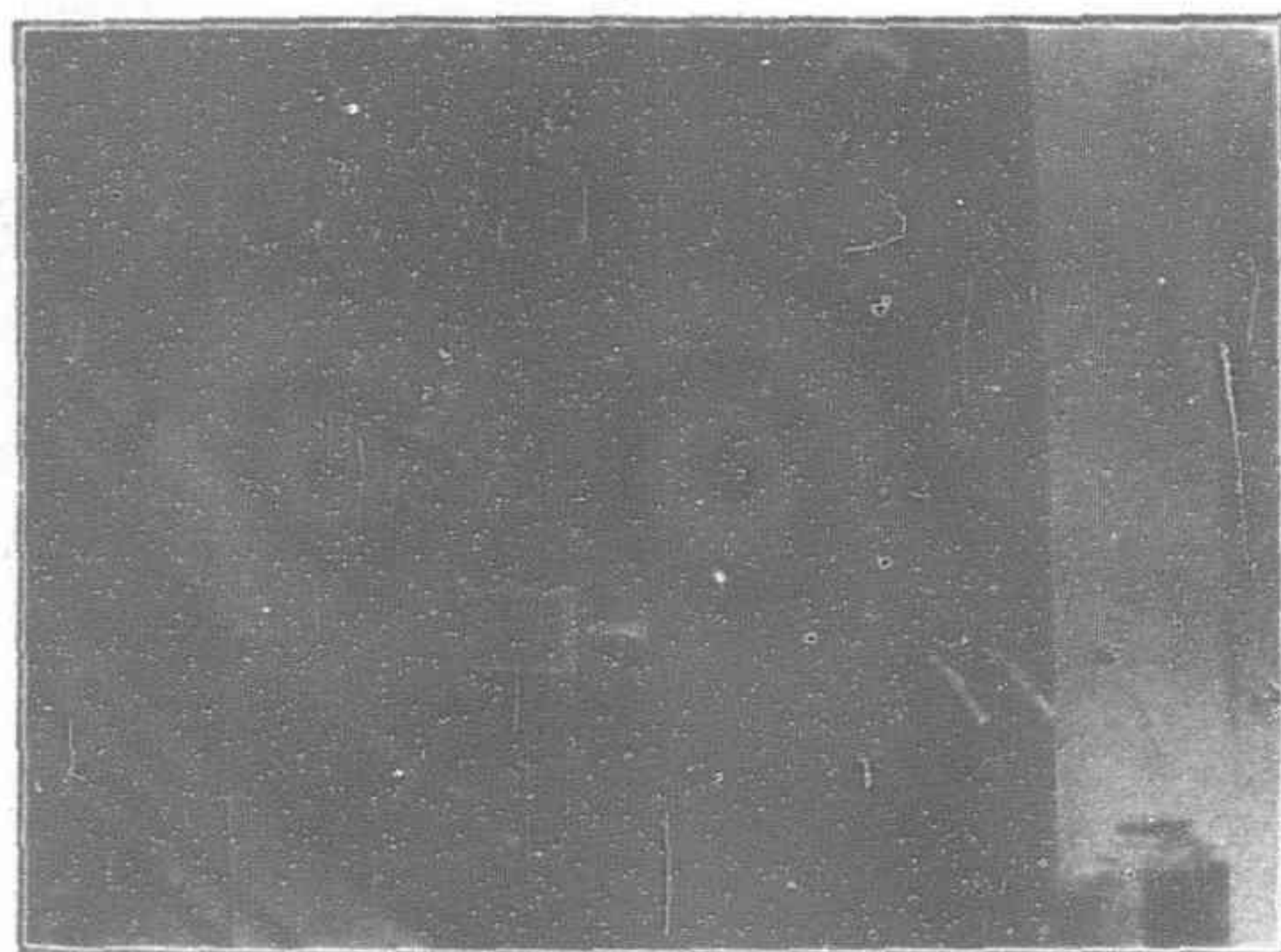
In the power room there are two sets of ringing machines, one belted to an A.C. motor, one a dynamo of bipolar type 22 V.D.C., both machines generating A.C. 75 v. ringing current are mounted, also a charging motor-generator—motor voltage 500 D.C., generator output 300 A. 30v.

In a separate building in the compound is mounted another charging generator of same type, belted to an oil engine.

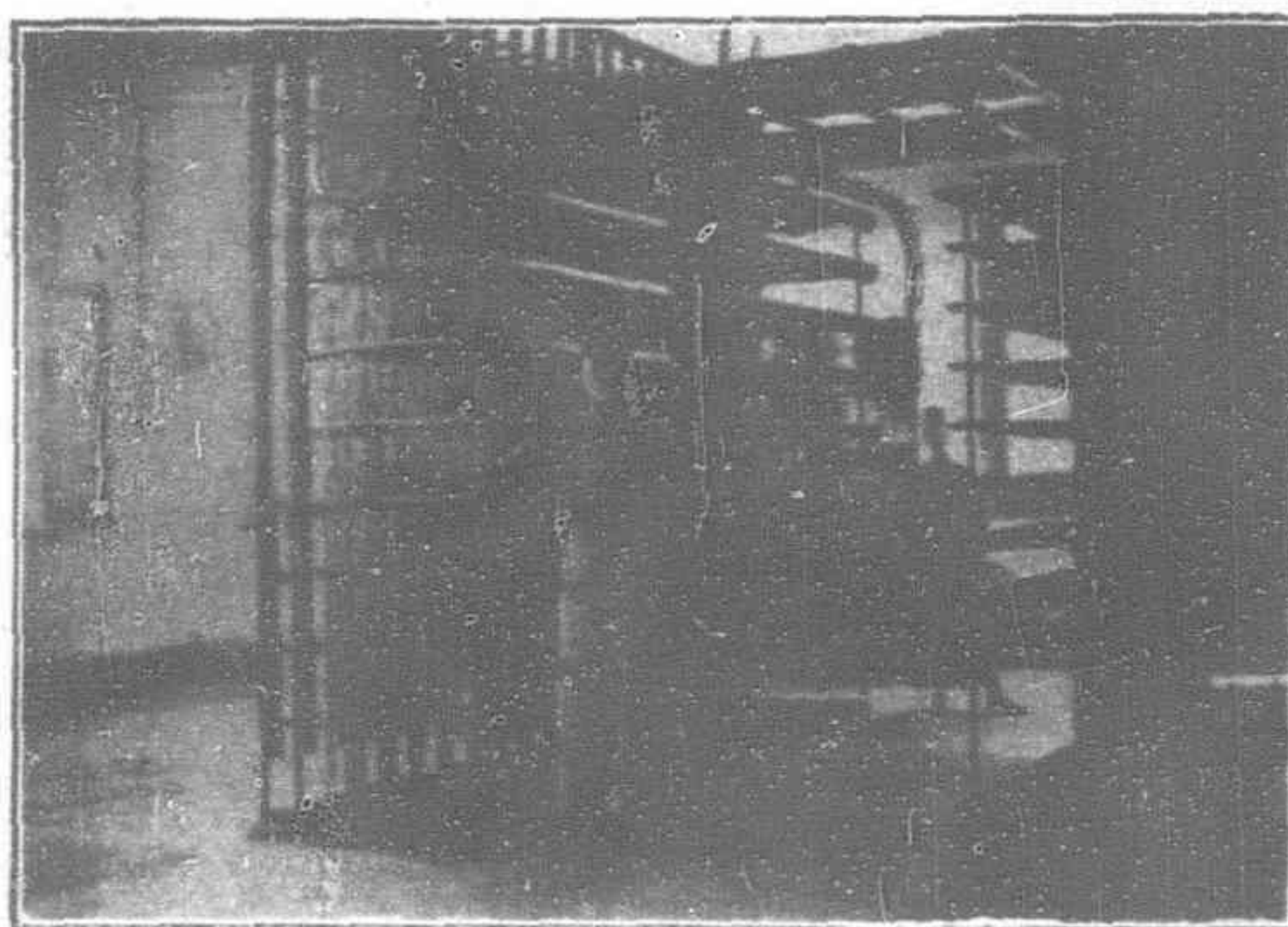
In the compound has been erected substantial quarters for the staff and a godown, both constructed in brick and concrete.

The outside cable system consists of about 4,000 yds. underground (300 p.) dry core cable and about 40,000 yds overhead cable. The length of aerial lines is about 20 miles. The total length of open wires being about 200 miles, and of cable wires about 1,500 miles.

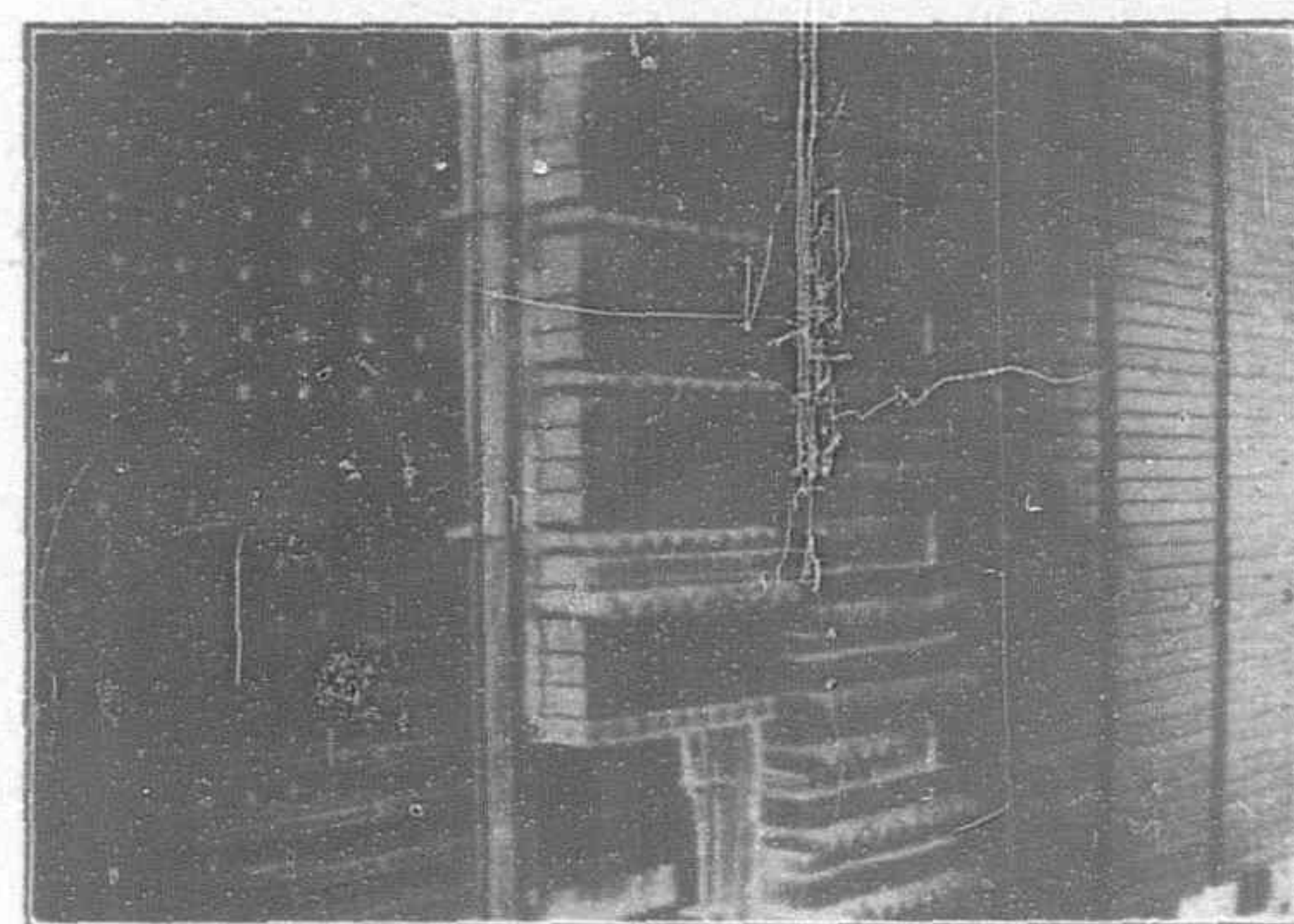
The subscriber's instruments are all of Western Electric manufacture, both wall and desk instruments being of the metal cover type with hand-micro telephones. The transmitters are of the capsule type.



Power Switchboard



Main and Intermediate Distribution Frames



Relay and Coil Racks

## Electricity in Tibet

### British Firm Providing First Generating Plant for Lhasa

THE first electrical installation for use in Tibet has been made by a British firm. The installation consists of an Armstrong-Whitworth water turbine direct coupled to a Crompton three-phase alternator of 125 Kva capacity, 500 v, 40 cycles working at 1,200 revolutions per minute. The alternator is provided with a direct coupled d.c. generator for supply of 20 kw at 220 v, for excitation of the alternator, and for other auxiliary work requiring a direct current. The design of the field magnets follows the usual practice adopted by Crompton & Co. for hydro-electric alternators which have to withstand test speeds of 80 to 90 per cent. above the normal full speed.

With this particular installation it was essential that all parts should be of the most robust character, in view of the peculiar conditions attached to this installation and the inaccessible district

where the plant is installed. It was necessary that the individual weights should not exceed 10 cwt. packed, it being necessary to transport the equipment for 350 miles by mules and coolies.

The plant was designed to operate continuously at a temperature rise not exceeding 35 deg. C., measured by thermometer after a six hours' run at full load on site, corresponding allowance having to be made on test here for the high altitude at Lhasa. The plant was constructed under detailed inspection of the Tibetan authorities from Lhasa, and the greatest care was observed in ensuring that all parts, spares, etc., would be interchangeable wherever possible in view of the fact that the plant would be erected entirely by Tibetans, no European engineers being permitted to enter the district.

The whole of the electric control gear was supplied by Crompton & Co., and comprises a standard open type switchboard with enamelled slate panels with the usual instruments, circuit breakers, current transformers, exciter, and field regulators, etc. There was also a special panel for the exciter and the d.c. feeders, and feeders for transmitting power some five miles away from step-up transformers.



# The Yue Tung Flour Mill at Shanghai

## A Sprout, Waldron & Company Installation



WHILE the staple food cereal of the great majority of the Chinese people remains, as it has been for centuries, rice, there is a steadily increasing demand in China for other cereal products. The Chinese who visit and remain for any length of time in the United States and Europe acquire a liking for the cereals

so largely consumed in those countries and there is a steady and increasing sale of wheat, corn, rye and barley flours to China. In many of the upland districts of China grain, other than rice, is successfully cultivated, but the Chinese facilities for its reduction to flour or meal are of the most primitive character and depend almost entirely on manual or animal power for operation. The fact that for the calendar year 1922 exports of flour from the United States to China amounted to 832,897 barrels, having a value of \$4,211,713, furnishes fairly good evidence of the growth in popular favor of the product of American flour mills.

But China is evidently not willing to depend entirely on imports for the flour demanded by her population in constantly increasing quantity. The introduction of a hand grinding mill of simple construction and its immediate popularity inspired the Chinese with the idea of making their own flour, and within the past few years some well-equipped flour milling plants, furnished with every modern improvement, have been established in different parts of the country. A considerable share of the machinery for these mills comes from the United States, the American milling practice, as practically manifested in the product of the American mills, impressing the Chinese buyer as most desirable. In 1922, flour milling machinery totaling 3,248,846 pounds in weight and valued at \$558,678 was exported from the United States to China, and 1923 is likely to show an increase in both volume and value in this export item.

The magnitude and character of the modern Chinese flour mill is shown in the illus-

trations of the Yue Tung Flour Mill at Shanghai, for which Sprout, Waldron & Co., of Muncy, Pa., U. S. A., furnished the equipment through their agents, Arnhold & Co., Ltd.

The main mill building follows what is known as the daylight plan of mill construction and is a substantial edifice of modern type of re-inforced concrete construction. The plant is of ample capacity for turning out 1,500 barrels of flour every twenty-four hours.

The grinding floor, which forms the subject of one of the illustrations, is equipped with 24 double stands of Monarch self-oiling roller mills, made by the above firm, a machine that enjoys the highest reputation for economy of power and minimum wear in operation and excellence of product.

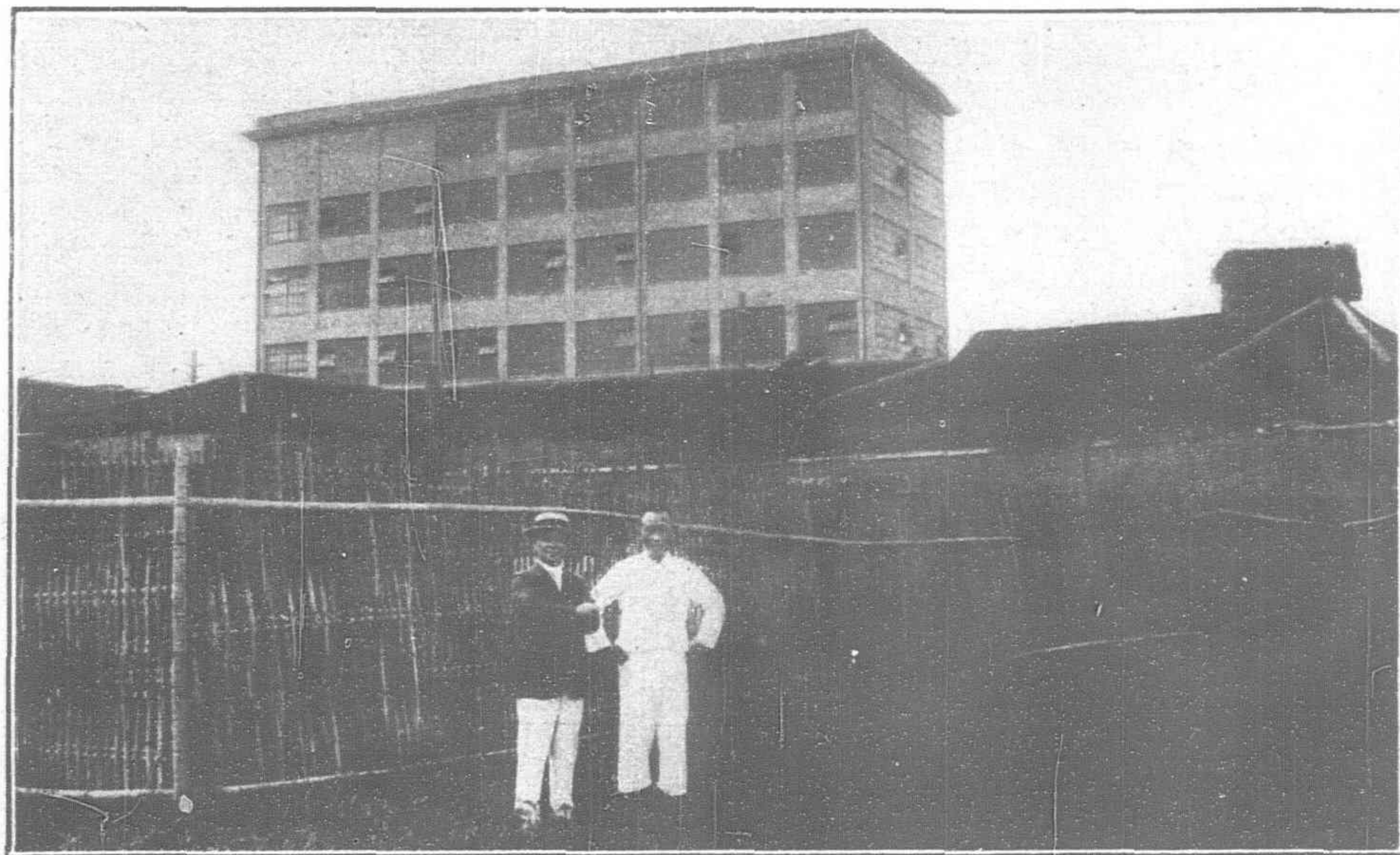
On the purifier floor, also illustrated, there are eight No. 3 middlings purifiers and graders, in which the middlings is handled before going to the break reductions. On the sifter floor, a view of which is also given, there are eight modern type level

sieve machines of the company's construction.

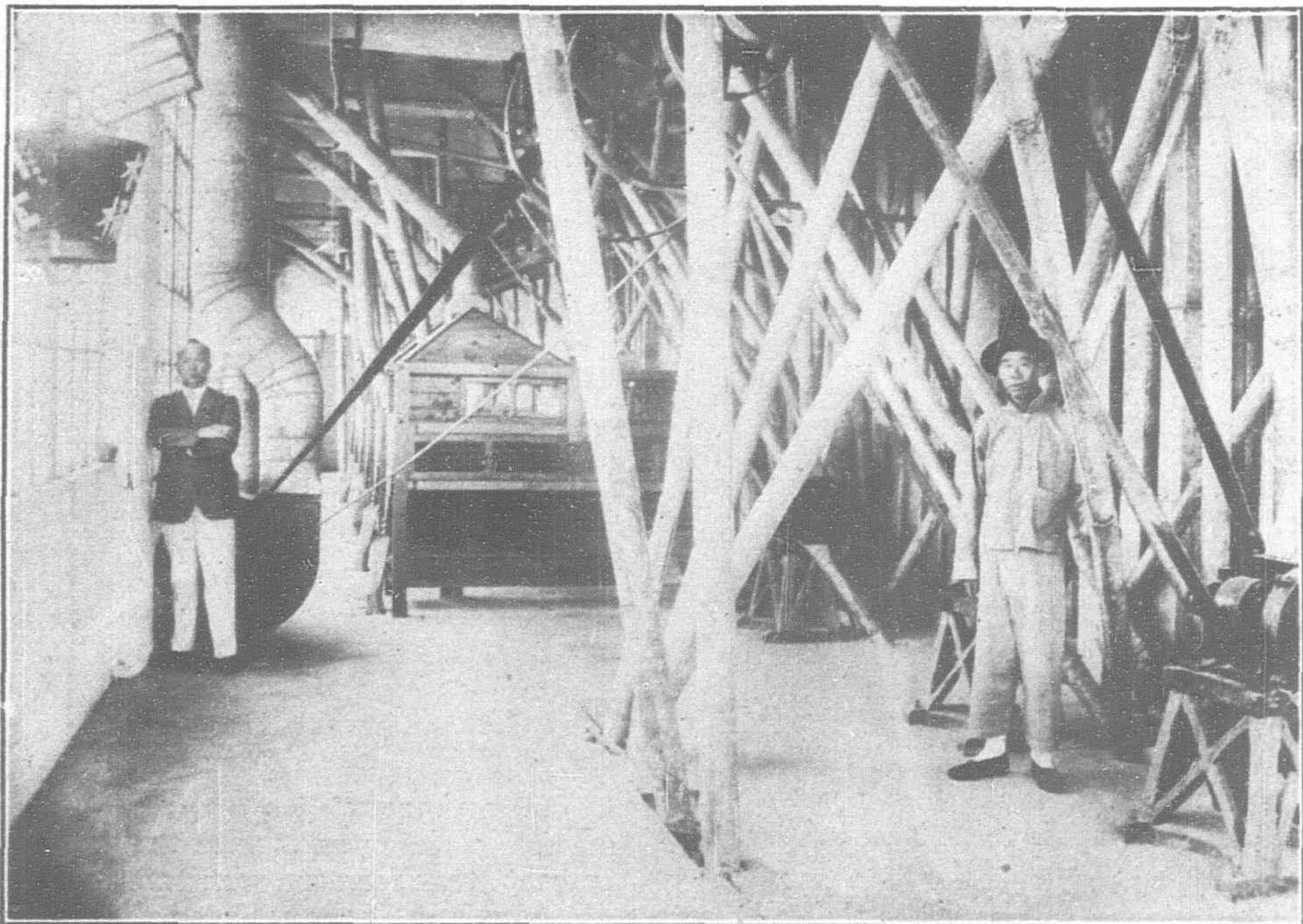
All the machinery installed is of the most approved and simplest construction, so that the least possible skilled labor will be required in its operation. The self-oiling feature is of particular importance, the duty of lubrication being practically dispensed with. The adjustment of the machines calls for no special skill and being for the most part constructed on the interchangeable plans, any renewals called for by reason of wear or accident can be readily effected.

In addition to the improved machinery, the equipment of the mill in every respect complies with the latest requirements of modern milling practice. Steel is used wherever possible in the installation work, which includes elevators, spouting, wind-trunking, dust collectors and all other accessories that enter into a complete plant of this character, so that the establishment is to all intents and purposes fire proof and is protected by the

(Continued on page 539.)



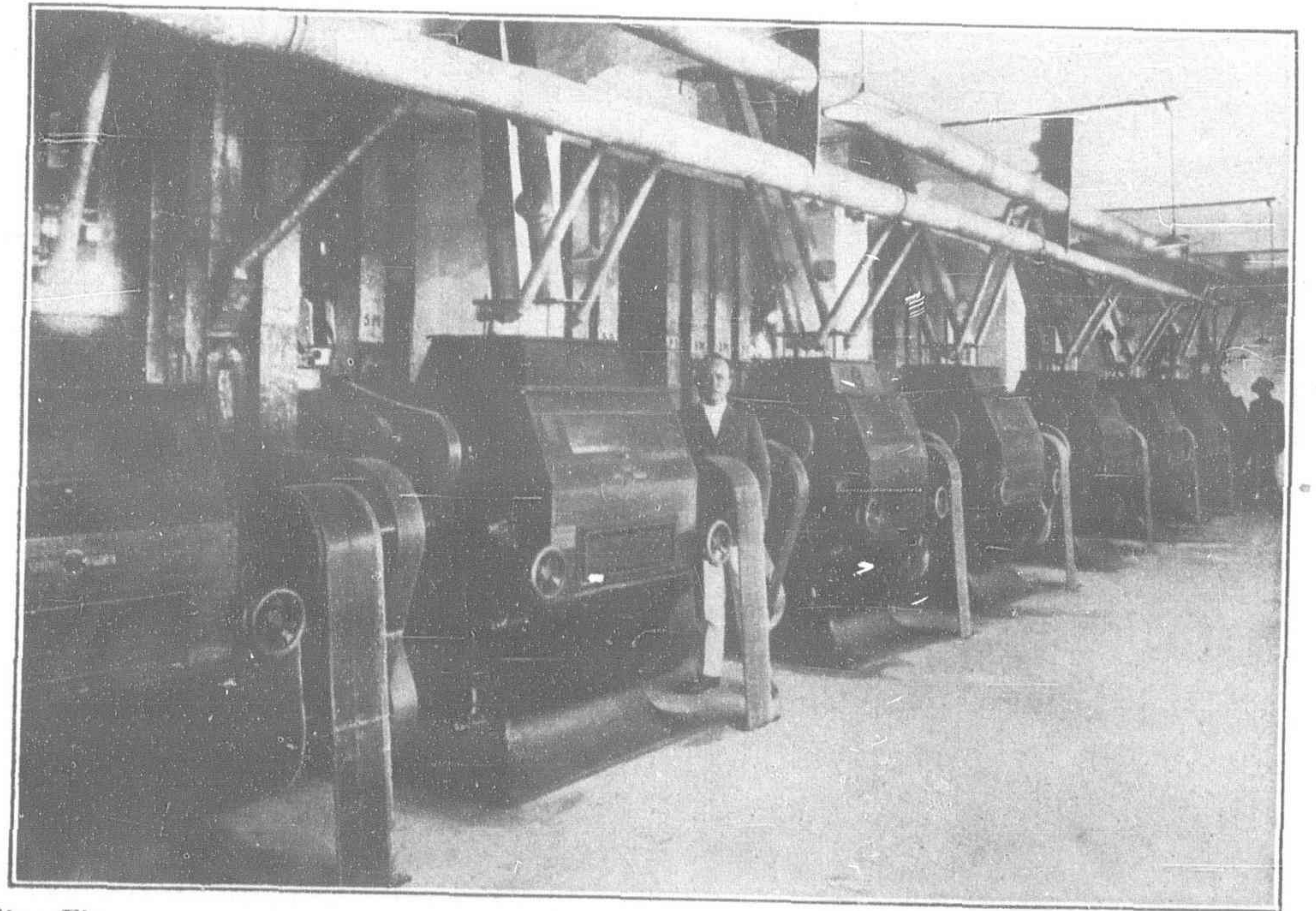
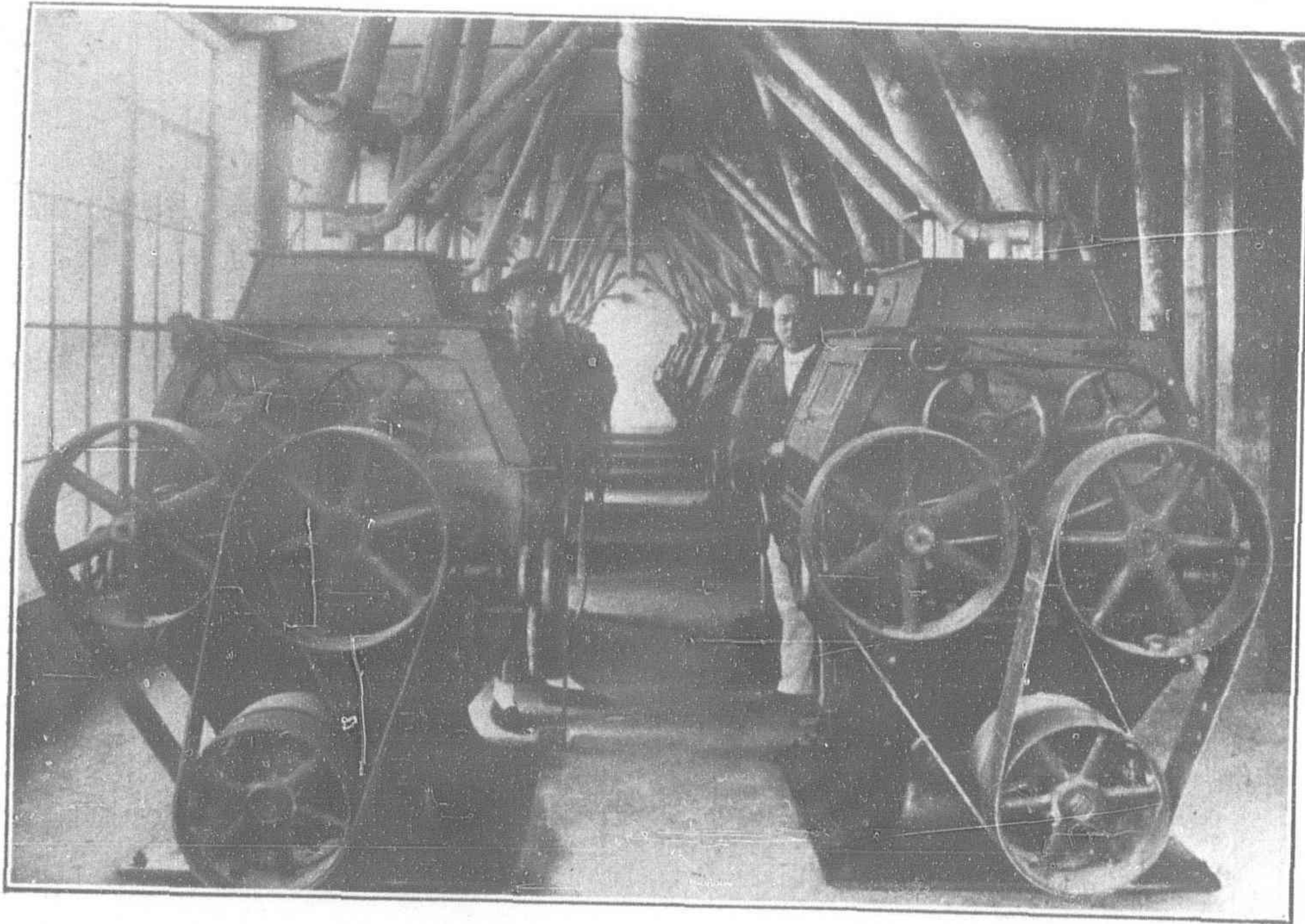
Yue Tung Flour Mill, Shanghai



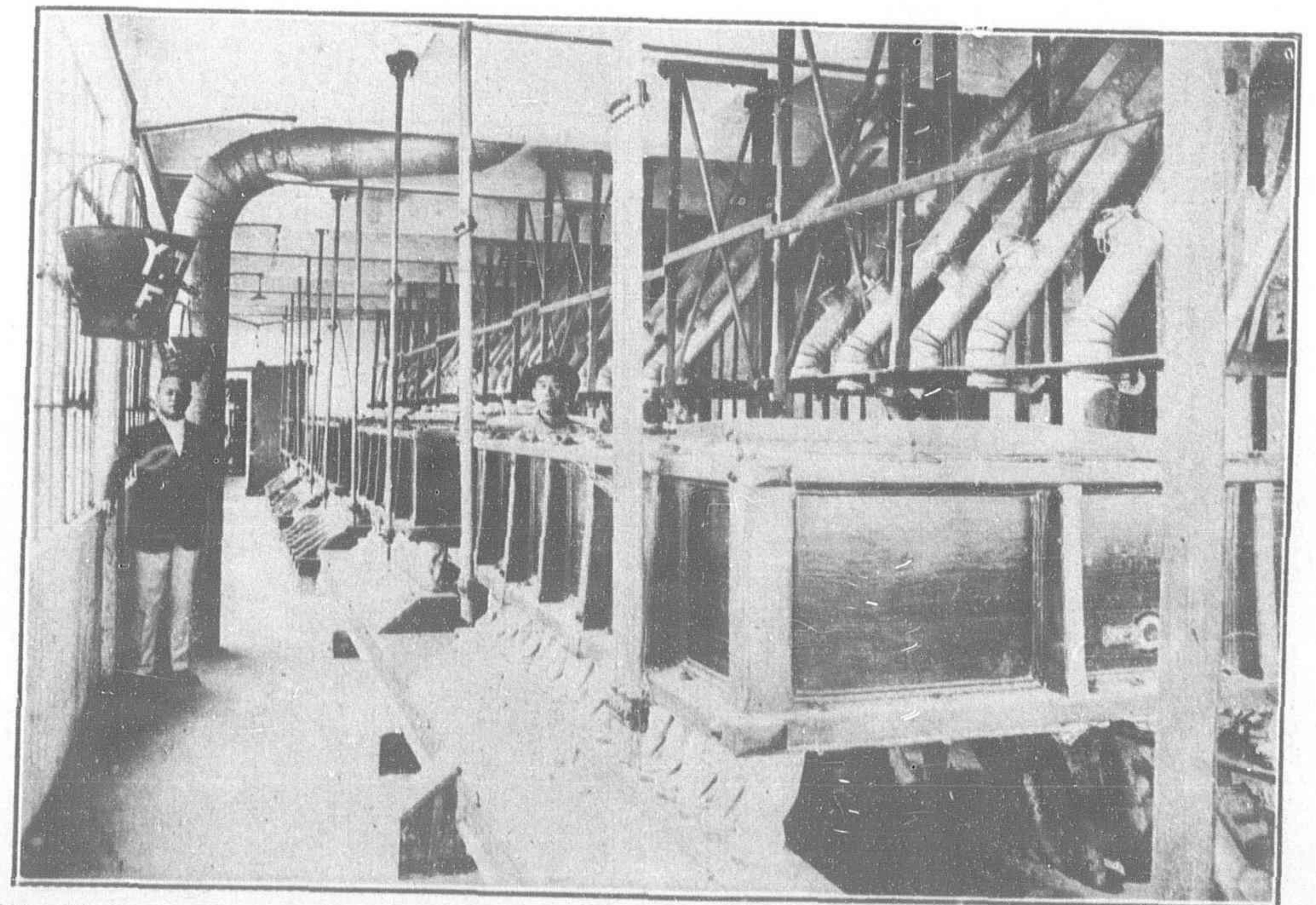
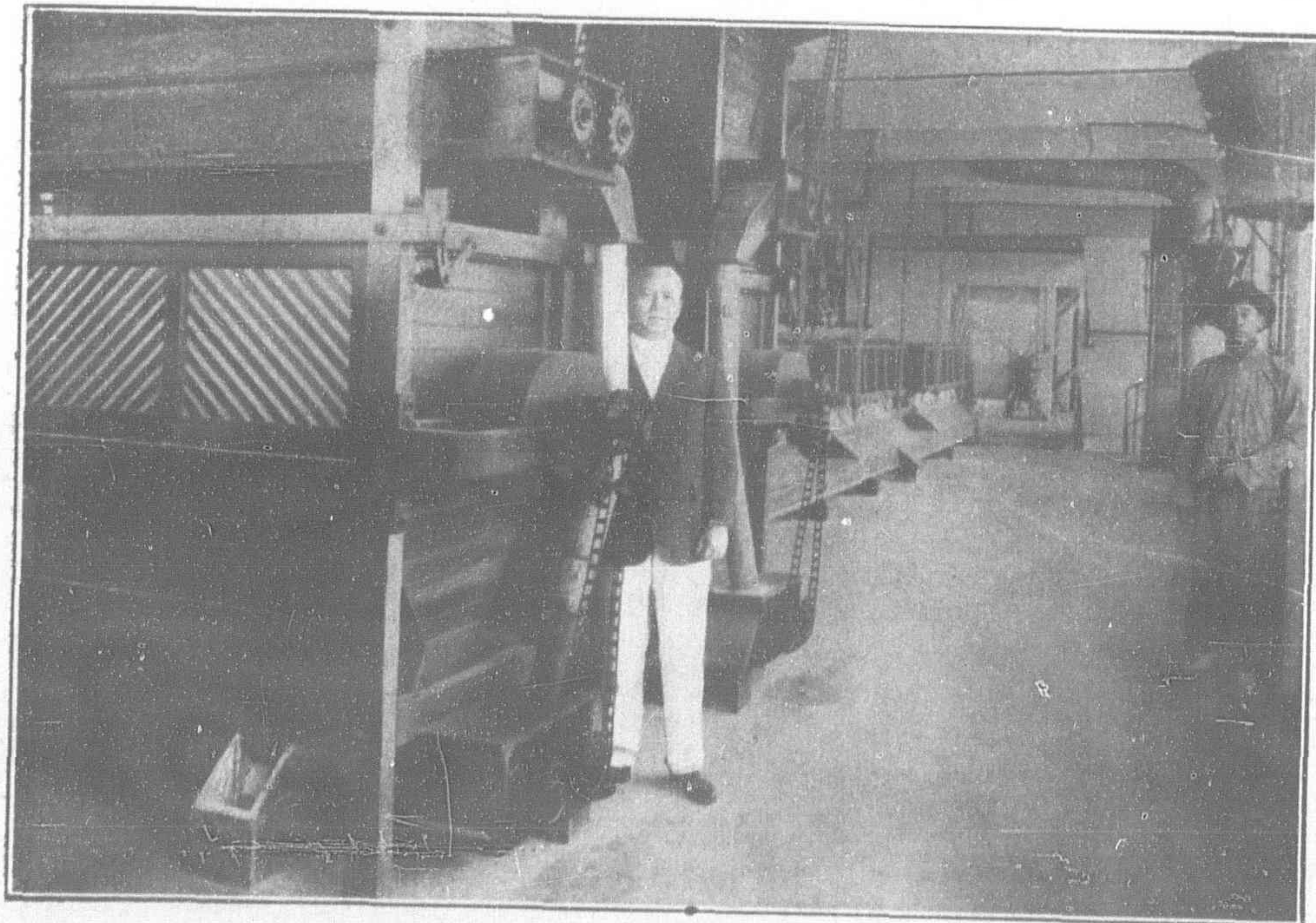
Purifier Floor of the Yue Tung Flour Mill, Shanghai



**THE YUE TUNG FLOUR MILL AT SHANGHAI**  
A Sprout, Waldron & Company Mill Furnished by Arnhold & Co., Ltd.

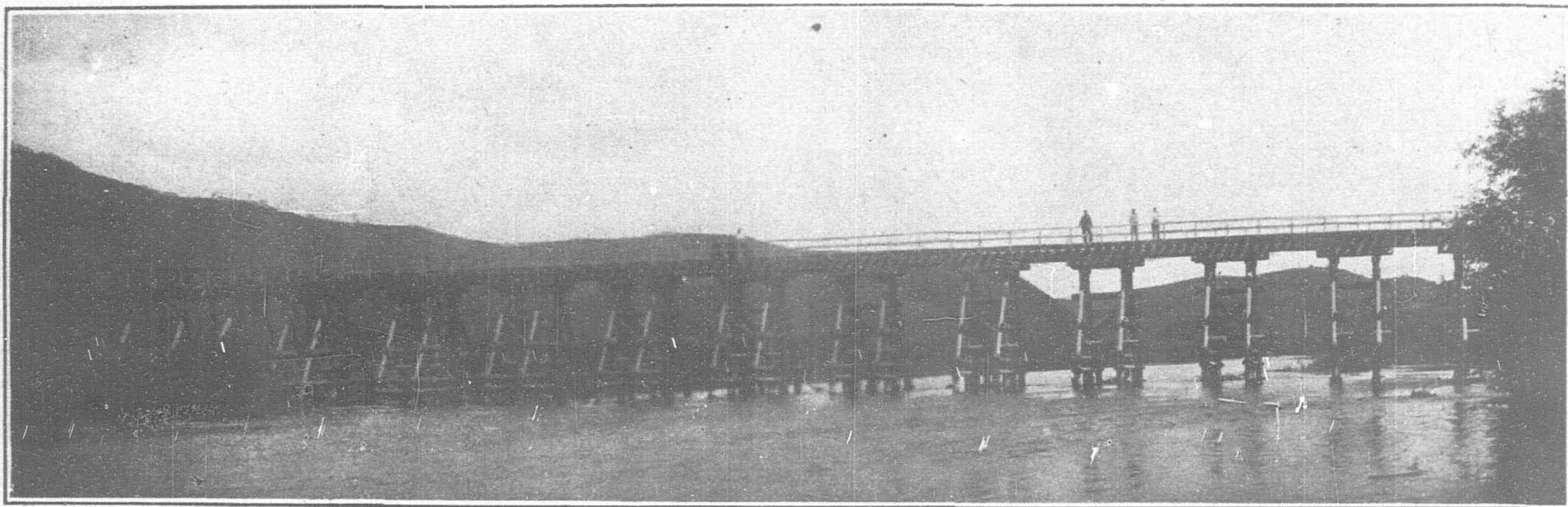


Two Views of Grinding Floor



Two Views of Bolting Floor





390-ft. Timber Bridge Across River Maihe at Imienpo

# Lumbering in North Manchuria

## Trials and Tribulations in the V. F. Kovalsky Concession Developments

**D**EVELOPMENT of the lumber industry of North Manchuria has been retarded from social, political and economic causes. It is slowly breaking through the crust of these influences and bids fair to become a factor in the world's lumber production. It is a country with large potential lumbering possibilities.

An interesting prospectus showing the timber concessions of V. F. Kovalsky, in North Manchuria, with head offices in Harbin, China, has been issued. The prospectus is printed in three languages—Russian, English and Japanese. It is well illustrated. The prospectus was issued to commemorate the 25th anniversary of the construction and operation of the Chinese Eastern Railway. The description of this pioneer lumber enterprise is illuminative of the tribulations encountered in the development of the North Manchurian lumber business. It is quite similar in many respects to the early development of the lumber industry of the United States, and especially of the Pacific Coast, British Columbia and other sections of the world.

The *Timberman* takes pleasure in reproducing the prospectus and also some of the pictures illustrating this Manchurian lumber enterprise.

The timber concessions, six in number, cover a general area of more than 5,000 square versts (2,200 square miles), located on both sides of the eastern line of the Chinese Eastern Railway, within 44 degrees 25 min. and 45 degrees 35 min. north latitude and from 128 degrees to 130 degrees 20 min. east longitude, and extending along the Chinese Eastern Railway from the Yakuni siding to Mulin station.

The above mentioned general surface area is divided into separate concessions as follows:

Concessions 1 and 2.

Concession Yablonia about 2,420 square versts (1,060 square miles).

Concession Imienpo about 450 square versts (105 square miles).

Concession Hailin about 650 square versts (285 square miles).

Concession Handachetze about 380 square versts (165 square miles).

Concession Mulin about 1,500 square versts (660 square miles).

Total—5,400 versts (2,275 square miles).

The rights of the firm in respect to all concessions are based on contracts, registered with the Chinese authorities.

On all concessions there is a total stand of timber, mostly cedar, of about one billion cubic feet.

The predominant tree species are cedar, fir, larch, oak, velvet tree, elm, etc.

The main lumber requirements constitute: (a) Chinese Eastern Railway: firewood and sleepers. (b) Export: Squared cedar logs, sawn materials, aspen logs for match manufacturing, hardwood veneer logs and mining timbers.

In addition to navigable rivers the concessions have at their disposal the following means for transportation of timber:—

94 versts (41 miles) narrow-gauge light track.

25 versts (11 miles) broad-gauge railway lines.

8 versts (3.5 miles) cableways.

250 versts (110 miles) common roads.

The firm possesses its own rolling stock, 70 open truck cars of a loading capacity of 700 poods (25,000 pounds) each. Loading and unloading is performed by cranes and other mechanical equipment.

A sawmill with seven frames and several working lathes is located at the Yablonia concession, with a yearly output of 3,000,000 cubic feet.

In the course of the operation of the concession permanent dwelling quarters (brick-built or hewn from beams) have been constructed with a floor space of about 1,200 square sagues (58,800 square feet) and temporary premises, huts, barracks, mud-huts, aggregating about 4,000 square sagues (196,000 square feet).

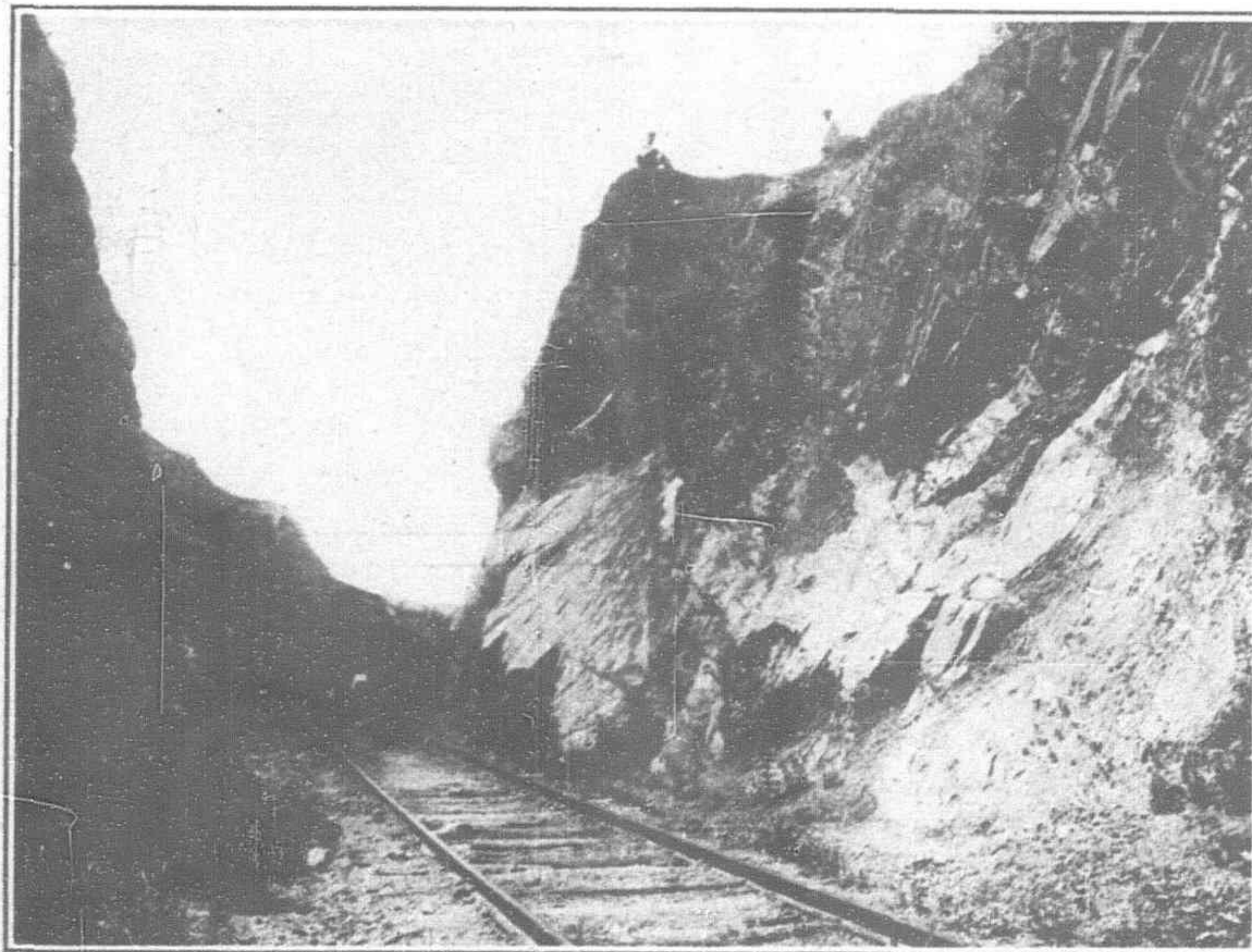
During the period of the operation of the concessions the firm has expended:

(a) For the construction of railway lines (exclusive of the cost of rails and rolling stock), narrow gauge, light track, cableways and common roads, 800,000 gold roubles (\$416,000).

(b) For repairs, maintenance and protection of the above roads, more than 270,000 gold roubles (\$140,000).

(c) For construction, repairs, maintenance, protection and insurance of dwelling premises with offices, about 315,000 gold roubles (\$164,000).

(d) For installation and equipment of sawmills, about 280,000 gold roubles (\$145,000).

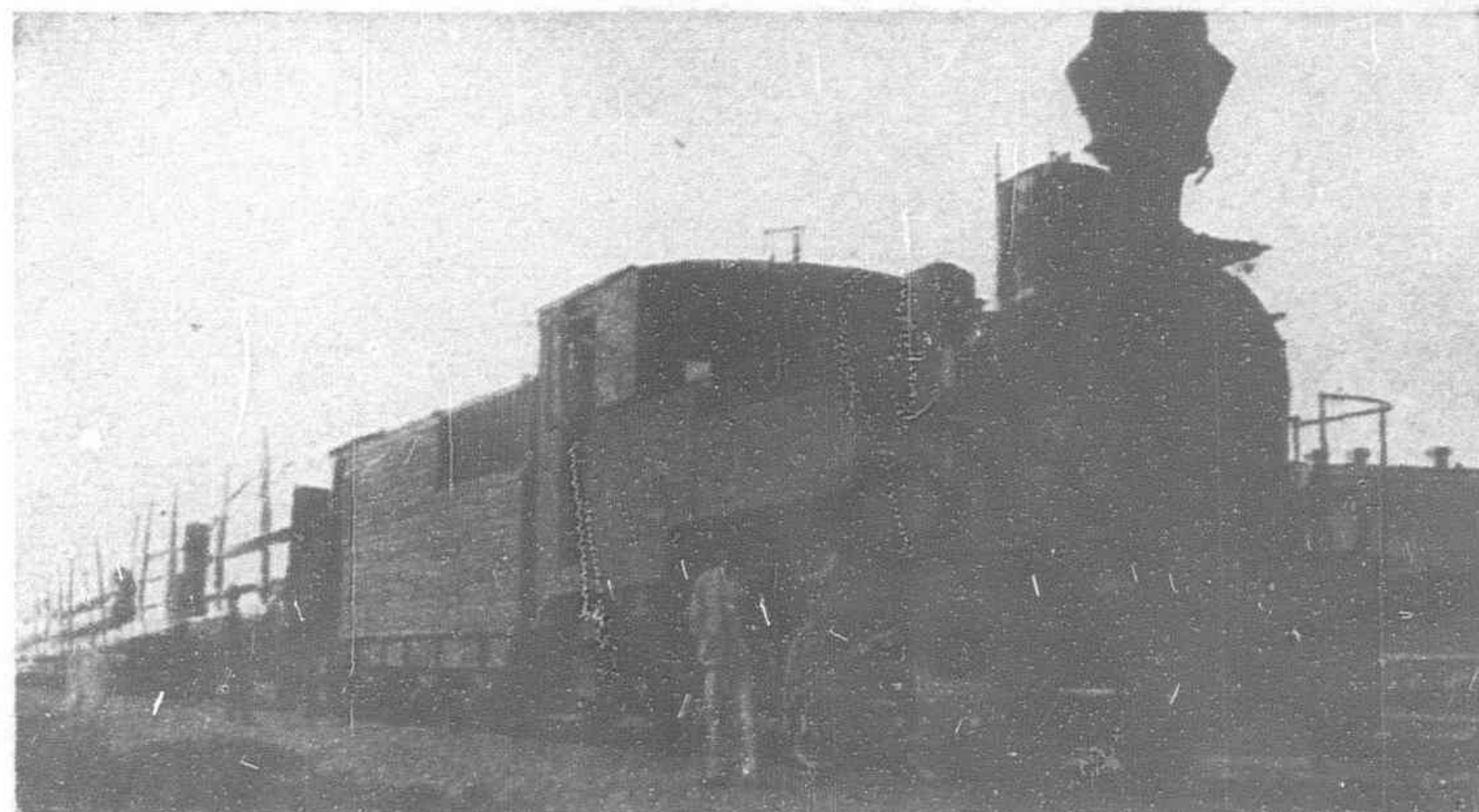


20 Metre Cutting on Concession Railway Line Near Imienpo





Log Jam on Liantzshe River Just Before it was Broken



Train on Concession Tracks Ready to Leave for Mill

(e) For operating expenses of all the concessions 8,435,000 gold roubles (\$4,385,000) have been disbursed, subdivided as follows: To workmen and cost of carts 5,391,000 gold roubles (2,805,000). Stump taxes, duties, taxes and sundry fees to the Chinese treasury, 1,232,000 gold roubles (\$640,000), and 1,812,000 gold roubles (\$942,000) for various general expenses, management, losses from fires, compensation for accidents, salaries, wages, gratuities, etc.

The total amount expended in the course of operation has been about 10,100,000 gold roubles (\$5,252,000).

The number of workmen employed on the concessions yearly fluctuated between 2,000 and 8,000 men, and the number of salaried employes between 400 and 300 men.

At present the different enterprises of the firm employ, exclusive of the staff in the offices, consisting of one construction engineer, four trained forest keepers, one legal counsel, four mechanical engineers, five commercial correspondents and seven interpreters for Chinese, Japanese and English business.

The main concession, Yablonia, is provided with a gymnasium, school, library and reading room; besides newspapers and periodicals are subscribed for all concessions for the benefit of the employes.

The importance of the enterprises and the activity of the firm in the region of its nearest influence can be characterized by the following data:

The territory, which is served by all the roads constructed by the firm, measures about 20,000 square versts (8,800 square miles).

The population of the territory consisted before the concession period mostly of hunters and vagrant elements and amounted to only 20,000 or 30,000 individuals, mostly men, whereas at the

present moment the population is over one million persons, including women and children.

Up to the inauguration of Kovalsky enterprises this country was almost a desert and now it is colonized exclusively by Chinese. Originally they engaged as workmen for various forest work, and later, having earned and saved a certain amount, they acquire livestock and inventories, settle down on vacant lots of land, and being to some extent protected from hunhutze raids in the neighborhood of the concessions, engage in farming, which represents the chief occupation of the settlers. During winter and at such times when not occupied by farming they work on the timber concessions, thereby making substantial extra earnings.

According to information gathered by the firm of V. F. Kovalsky, the production of the above named territories, gathered from its fields in 1921, comprised: Ten million poods (360,000,000 pounds) of cereals, beans, kaoliang, kutza, wheat, buckwheat, barely, corn, paitza, rice, mitza, and about 1,000,000 poods (36,000,000 pounds) of special plants used for technical purposes, including hemp, indigo, tobacco, poppy, etc., in addition to the products of gardening, cattle breeding and poultry raising.

From this data one may judge the benefits the timber enterprise of this firm has confirmed upon the whole region in a comparatively short period. The material and economic progress of the territory, which was previously a desert wilderness, is due not only to the united management of the firm's staff, but also to the far-sighted assistance rendered by the Chinese Eastern Railway, skilfully directed by a single will, and to the energy and efforts of the railway employes.



Logs on the Up Grade

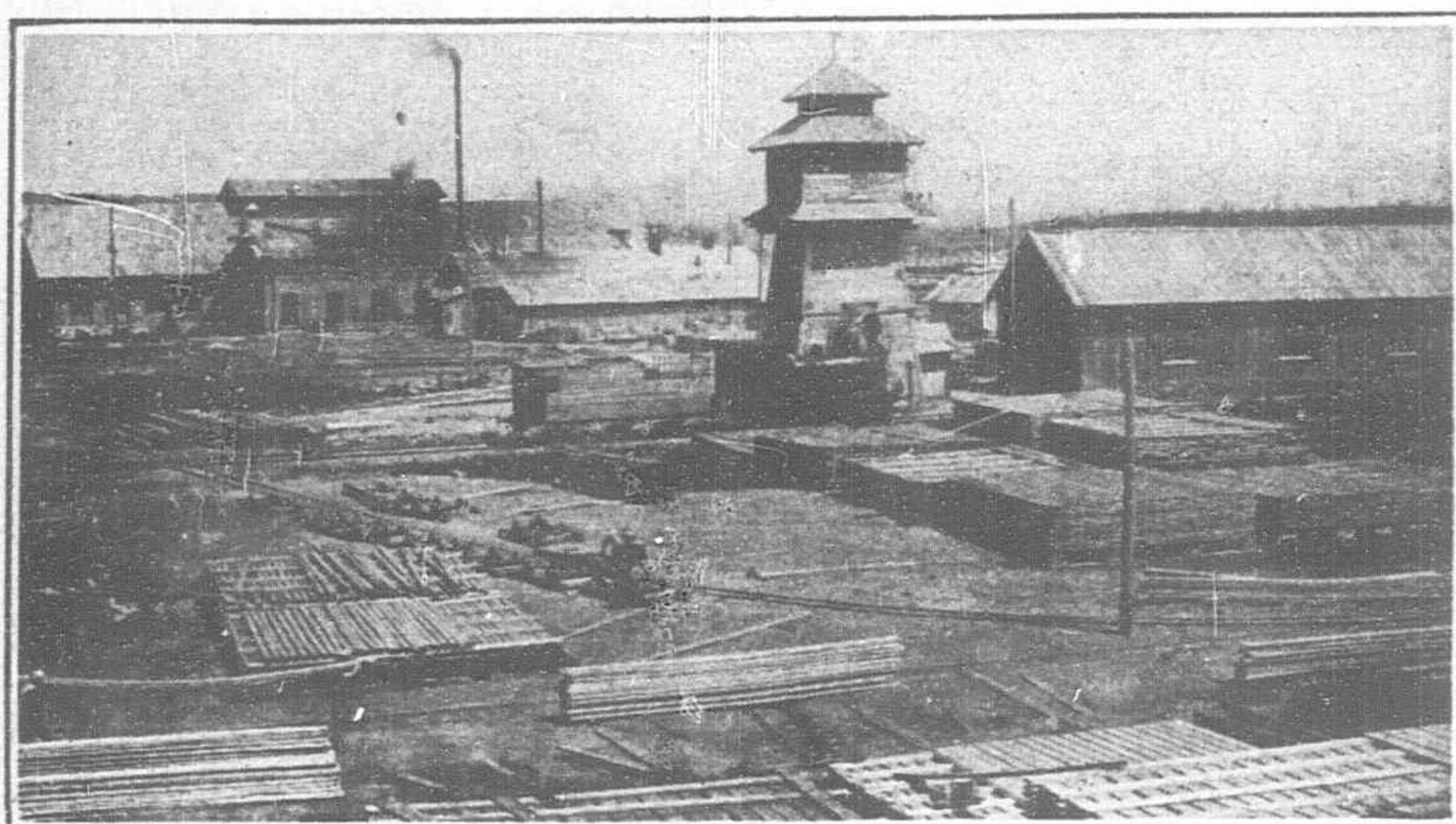


Loading Cars for the Cableway at Hantaohetze

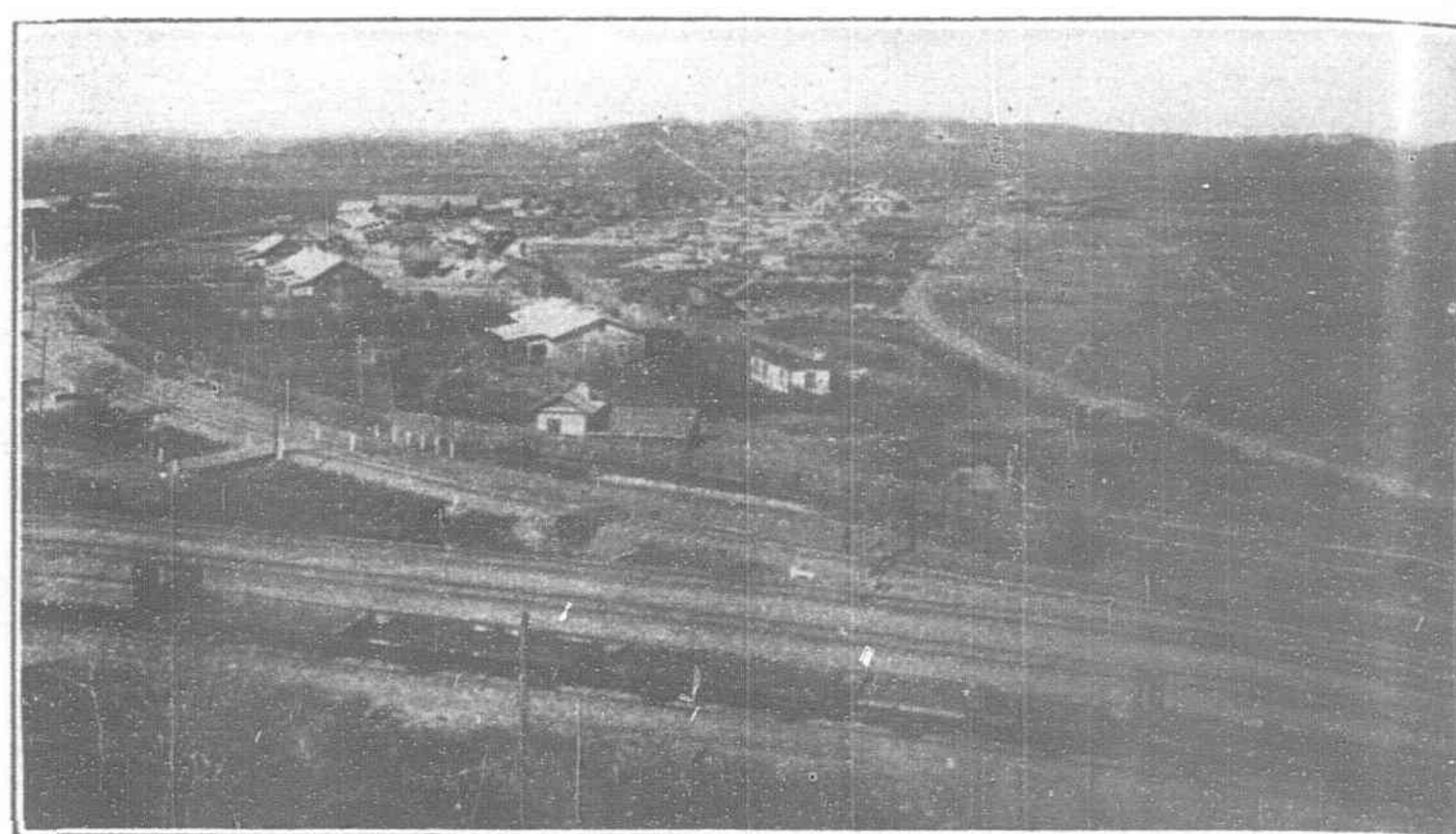


Waiting for the Cable Log Train up the Hill at Hantaohetze





The Sawmill at Yablonia



General Layout of Yablonia

The development of the firm of V. F. Kovalsky is closely connected with the history of the Manchurian timber industry in general and with its origin and evolution up to the present time, the Chinese Eastern Railway and extending along its eastern line.

The history of this industry may be divided into four periods, which may be generally characterized as follows:

The first period extends from the beginning of the construction of the Chinese Eastern Railway up to the beginning of operations on the first of July, 1903.

Prior to the construction of the railway the immense neighboring forest zone, being of the same extent as the kingdom of Belgium, was an absolutely wild desert and marshy country. Bogs were predominant, even on the steep slopes of hills, without any population, lacking roads and only crossed by hunters' tracks.

Human habitations were rare, consisting of wretched mud huts, hastily erected from brushwood and covered with mud, with unglazed windows and inhabited by hunhutzes and half-savage hunters. Still more rarely in the impassable forest, generally along the river valleys, one might have found meadows covered with high, dense grass, concealing traces of villages destroyed or burnt by hunhutzes. These are the traces of the colonization policy of the government, persistently carried out during a long number of years, and which always experienced setbacks, because of the absence of roads and the remoteness of the territory from large centres.

It was only natural that in such a country the first work carried out by the constructors of the Chinese Eastern Railway was forest work, cutting trails for temporary cart roads, clearing land for settlement, providing fire wood for the severe Manchurian winter and producing beams for dwelling houses, bridges, telegraph poles, sleepers, joists, planks and other materials for the enormous requirements of the Chinese Eastern Railway under construction.

The whole railroad system was inspired by the genius of Mr. S. J. Witte, who was the chief organizer of the Chinese Eastern Railway through Manchuria, and who chose for the exceptionally responsible post of chief engineer and leader of the peaceful policy, Mr. A. J. Yugovich, a man with vast experience, good sense, firmness of character, with American resourcefulness and without the bureaucratic routine principles, which were peculiar to many eminent constructors of Russian railways in those days.

Eighteen months had hardly passed since the beginning of the work when an important part of the territory of the Chinese Eastern line, about 300 versts (200 miles) was covered with stores of beams, sleepers, joists, planks, firewood and telegraph poles. However, such preparation for timber were made exclusively for the construction requirements of the railway and therefore were not of any industrial importance. Later, when the track had been laid from Harbin to Shitouhetze, at the end of the year 1899, private con-

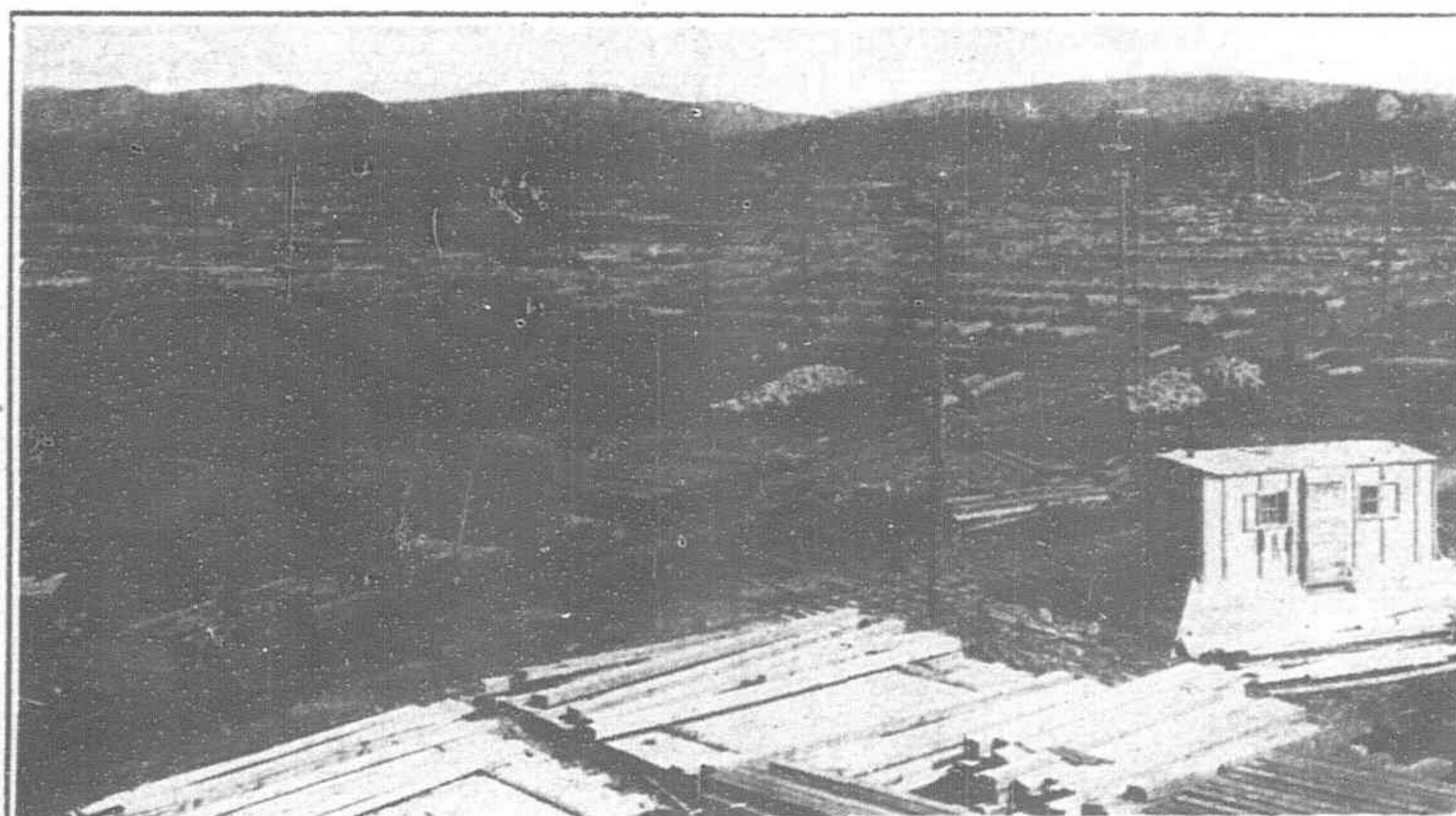
tractors began gradually, and for their own account, to start logging operations and to transport timber materials and firewood to Harbin. However, the Boxer movement of the year 1900 stopped this work and for almost two whole years drove out private initiative and capital, which had already begun to come in from Russia.

After the liquidation of the Boxer insurrection logging operations again rapidly developed, though they continued to be almost exclusively carried forward for the requirements of the Chinese Eastern Railway and at its expense.

After the opening of regular traffic on the Chinese Eastern Railway on the first of July, 1903, logging operations by the railway were discontinued, with the view of ascertaining the exact yearly requirements of the railway for firewood and various timber materials. The plan contemplated the introduction of regular timber exploitation in the future and to attract big contractors who should work with their own capital and their technical staff and resources. However, the timber industry, which had just started again, was stopped in its development

by the Russo-Japanese war, and soon fell into a chaotic state. A great many people quickly enriched themselves on timber deliveries to the railway and particularly to the war department and afterwards lost very quickly what they had gained, and were ruined. This period of feverish activity in logging operations called forth by the war, the gradual decline of this industry and its almost complete standstill, excepting a few insignificant deliveries to the railway, lasted about five or six years and did not give any positive results in the development and strengthening of the timber industry along the eastern line of the Chinese Eastern Railway.

The third period is the history of the timber of North Manchuria began with a slow and at times irregular influx of private capital, which soon increased and grew stronger in spite of many unfavorable circumstances, the promoters and the capital being almost entirely Russian. During the construction of the Chinese railway and especially during the Russo-Japanese war, all the forests near the railway and the best stands of cedar, velvet, oak and nut trees, were logged out for a considerable distance from the railway, and the concessionaries were obliged to expend a lot of time, energy and money for the exploration of new forest zones, prospecting and laying new and extensive railway lines, with high mountain crossings, construction of dwelling houses for employes on a large scale in uninhabited and desert districts, the organization of storehouses containing articles of daily need, the transportation of large parties of workmen and for many other requirements. General expenses and overhead charges grew accordingly, as well as the wages to the workmen. On the other hand, the Chinese Eastern Railway remained the chief purchasers of timber material, and being a commercial enterprise the railway obviously was not obliged to



Products Stacked Ready for Shipment from Yublonia Yard



consider the profits of the contractors and, therefore, in competitive biddings the railway sometimes fixed the purchase price below the cost of production.

Up to the years 1913-1914 the demand for timber materials had been quite insignificant in the local market. The money market was an extremely poor one and for this reason it was difficult to obtain longterm credit for logging operations and only granted at an exorbitant rate of interest and for small amounts. The insufficient protection against hunhutes, especially in forest and hilly districts, remoteness from the railway, increased the difficulty of insurance of property and timber stores against fire and of employees against accidents. Insurance was either impossible or too expensive.

All these unfavorable circumstances greatly hindered the maintenance and development of the business, and therefore not only was there an absence of an influx of new funds or progress in the timber business, but many strong, private contractors were ruined. An export of timber to England gradually began to be organized in the years 1909-1914 and the prospects for big sales were very alluring, but the shortage of sea tonnage and the danger of the blockade put a complete stop to this venture in the first year of the great war.

The increased building activity in Harbin and along the Chinese Eastern Railway as well as the building activity among Russian refugees, with a large influx of gold brought from Russia, which began with the great war, tended temporarily and irregularly to increase the demand for timber. However, all this revenue brought by the war and the revolution in Russia, was soon more than offset by the tremendous losses from the depreciation of Russian currency and its subsequent complete abolition.

All the above shows that the timber industry in North Manchuria had inevitably to enter the new period, the fourth in its existence, a period of more quietly planned work with steady and increasing export and intensification of the production of dressed timber.

The previous period must be taken as a preliminary to the establishment of normal work. The time must be entirely forgotten when all lumber work was carried out by manual labor and only rough materials were produced, when even big firms could start without any steady basis, the local market possessing neither available funds, technical staff, apparatus or qualified workmen; when everything had to be imported from far away Russia, or for Russia's account from Germany or America, when China, at her own risk, was obliged to import big parties of workmen, often losing the advances paid to them. Owing to the remoteness from industrial centers the ordering of machinery and its erection were extremely expensive in view of the absence of skilled mechanics. The delivery of machinery delayed the work for indefinitely long periods, and very often such ventures ended in failure.

The prices on timber products were also subject to violent fluctuations, the price of one cw. saqueur (343 cubic feet) of firewood fluctuated between 12 gold roubles (\$6.25) and 50 gold roubles (\$26), and sleepers from 60 kopecs (31 cents) to two gold roubles and 25 kopecs (\$1.15) per piece.

During the last lumbering season, the winter of 1922-23, the firm executed all orders from the Chinese Eastern Railway and prepared all necessary timber material for the local market, and it is likewise in a position to fulfill all such requirements. However, taking into consideration the yearly decreasing demand of the Chinese Eastern Railway and of the local market, the firm of V. F. Kovalsky, after investigation of the foreign markets, has been exporting timber since 1912 to Japanese and Chinese markets and the South Manchuria Railway. The scope of this business has always been determined by internal and foreign political circumstances and by the conditions of traffic.

The important increase of export and the very profitable sale of timber to remote foreign markets are especially due to the favorable political conditions, as the chief supplier of timber in the world—Russia—will not soon be able to export, whereas the supplies of Manchurian timber, particularly on the concessions of V. G. Kovalsky, are very large.

At the beginning of this article is indicated the area of the forests. The Mulin concession has been acquired only recently, and therefore lacks railways. For this reason it will not be taken into consideration in the subsequent calculation. The other concessions already provided with tracks, dwelling houses, storehouses, fire-prevention equipment and accessories, arrangements for loading

and unloading, workshops and mills, possess a reserve of timber calculated at over 850,000,000 cubic feet, which would yield a yearly output of about 34,000,000 cubic feet, with a turnover in 25 years.

Proposing, as in former years, to produce not less than 30,000 cw. sages (10,290,000 cubic feet) of firewood and 50,000 cubic feet of sawn timber for Harbin and Fuchiatien, and for export, besides about 3,000,000 cubic feet sawn material from seven timber-sawing frames, the firm still retains an enormous quantity of timber.

An equally considerable timber reserve remains on the Mulin concession in addition to the reserves of aspen, alder, birches, etc., which have not been included herein.

Taking into consideration this enormous timber supply and the development of its exports, the firm realizes the inevitable necessity of abandoning the raw material industry for manufacturing, and therefore intends to open the following industrial enterprises:

A factory to produce glued veneer, with a yearly output of 30,000,000 cubic feet, manufactured from aspen, birch, oak and velvet wood.

A match block factory, using aspen wood, with a yearly output of 500,000 cubic feet.

## Russian Far East Timber

The Far East Land Authority, after investigation, estimates that with the exception of the forest land alienated to the Buryat-Mongolia republic (amounting to five and a half million dessiatins), a total of 82,399,000 dessiatins of timber lands remain in the far Eastern government. (The dessiatin is equivalent to 117,600 square feet, or  $2\frac{3}{4}$  acres.) This total includes 72,949,000 dessiatins of land covered with timber and 9,440,000 dessiatins not covered. The useful timber land is estimated at 45,688,000 dessiatins, making 55 per cent., of the total forest land and 63 per cent. of the specifically forest land. This embraces all the forests of Transbaikalia, the Amur and the Primorsk, and includes the island of Saphalien and the Kamtchatka government. It leaves out the marshland. From this data it can be seen that previous estimates which showed a total of forest land in the far eastern government amounting to 116,000,000 dessiatins, and the total useful forest land amounting to 83,000,000 dessiatins, were greatly exaggerated. The distribution of the forests according to governments and wooded area can be seen in the following statement:

Government	Timber Area		Useful Timber Area		Percentage of Timber Area
	Dessiatins		Dessiatins		
Primorsk .. ..	32,220,000		19,544,000		64
Saghalien .. ..	2,500,000		1,560,000		79
Amur .. ..	21,224,000		11,334,000		58
Transbaikalia ..	21,165,000		10,610,000		77
Kamchatka .. ..	5,280,000		2,460,000		4

Forest investigation and organization began in the timber lands of the far eastern governments in 1909, and continued on to 1915. Without going into the particulars per government, it is enough to say that 3 per cent. of the forest land was organized, 14 per cent. was investigated, leaving a balance of 83 per cent. not dealt with.

With the data that has just been procured it is exceedingly difficult to establish even theoretically any estimate approaching reliability of the possible annual disposal of timber materials in the forest lands of the far eastern government.

As to the more immediate position, that is, from the active point of view of the trust called the "Dalproubureau-Dalles," which exploits the Russian Far East timber lands, the export figures for last year are repeated in a general review of the Far East industrial position, showing that over three and a half million cubic feet were exported out of the country yielding an appreciable profit. But the program for the new campaign is more extensive. It is planned to produce 18,000,000 cubic feet, while it is claimed that over ten million cubic feet have already been sold for export, the buyers being Japan and China. Plans are being drawn up for a five-year program, at the end of which the production is estimated at 90 million cubic feet.—*The Timberman*.



# The Makasan Shops of the Siam State Railways

## A Description of the Repair Facilities Provided for Rolling Stock

**T**HE principal locomotive, carriage and wagon works of the Siam State Railways are situated at Makasan, a suburb of Bangkok on the Bangkok-Petrie line, about 5 kms. from Bangkok terminus. Here all repairs to locomotives and rolling stock, working on the east bank of the Chao Phya River (the Menam), are carried out. In addition a large quantity of new rolling stock has recently been built. This consists of new bogie passenger carriages and new goods stock; for the former the steel underframes, bogies and portion of the steelwork come from abroad and the bodies of teak are built at Makasan works. As regards the goods stock, the bodies and underframes are of teak. The bogie passenger carriages are metre gauge 18,288 m. long over buffers, 2,438 m. wide and 3,553 m. high from rail. Wagons are of 10,000 kilogrammes capacity.

The works occupy a total area of 309,616 square metres; of this the various workshops cover an area of 24,000 square metres. Employment is found for approximately 1,000 men and boys, these being chiefly Siamese with a small number of Chinese, Indians, Malays, and others.

The works are equipped with a large number of up-to-date machines, all of which are electrically driven, the majority of the larger machines by independent motors and the others in series from line shafting.

### Power House

Superheated steam at 150-lb. per square inch is generated by two Babcock & Wilcox water-tube boilers and two Cornish boilers; wood fuel is being used; the former boilers are equipped with special furnaces for burning shavings, sawdust and refuse from the sawmill.

The engine room contains two "Belliss and Morcom" high-speed vertical compound engines, coupled direct to D.C. generators, each capable of generating 435 amperes at 220 volts. In addition there are two horizontal engines, driving dynamos by belt, each generating 77 amperes at 440 volts. These four engines have one common surface condenser.

The air compressor is of the vertical two-stage type, delivering 350 cubic feet of free air per minute at 100-lb. per square inch pressure.

### Provision for Locomotive Repairs

The erecting and boiler shop is 116 metres long and 42 metres wide, divided in the centre by a traverser pit. One side of the traverser pit is used for the dismantling and erecting of engines and contains 15 pits. The opposite side is used for boiler and tender repairs. The boiler repair bay is equipped with the following machine tools:—bending rolls—capable of rolling plates up to 12 feet wide and 1½ inch thick; punching and shearing machine—

capable of shearing 1½ inch steel plate; punching and shearing machine for ¾ inch plate; 4 feet radial drill; portable pneumatic tools; tube rumbler, etc.

Each bay is served by an overhead electric traveling crane of 10,000 kilogrammes capacity. The capacity of this shop is over 40 engines per year.

The machine shop is 60 metres long and 25 metres wide. It contains close upon 100 machines of great variety, some of these are of the latest design and the following are worthy of mention:—"Webster and Bennet" 42 inches duplex boring mill, "Asquith" 5 feet 6 inches radial drilling machine, "Bateman" high speed planting machine, "Craven's" 5 feet 6 inches high-speed wheel lathe, "Craver's" horizontal boring machine, "Selson" 4 feet high-speed drilling machine, "Holroyd" 6 feet boring mill, "Beyer and Peacock" 72 inches planer grinding machine, "Holroyd" planer milling machine, "Swift" high speed lathes, "Cooper's" turret, finisher lathes, semi-automatic lathe, "Hartness" turret lathes, grinding machines. This shop is served by a 2½-ton electric crane.

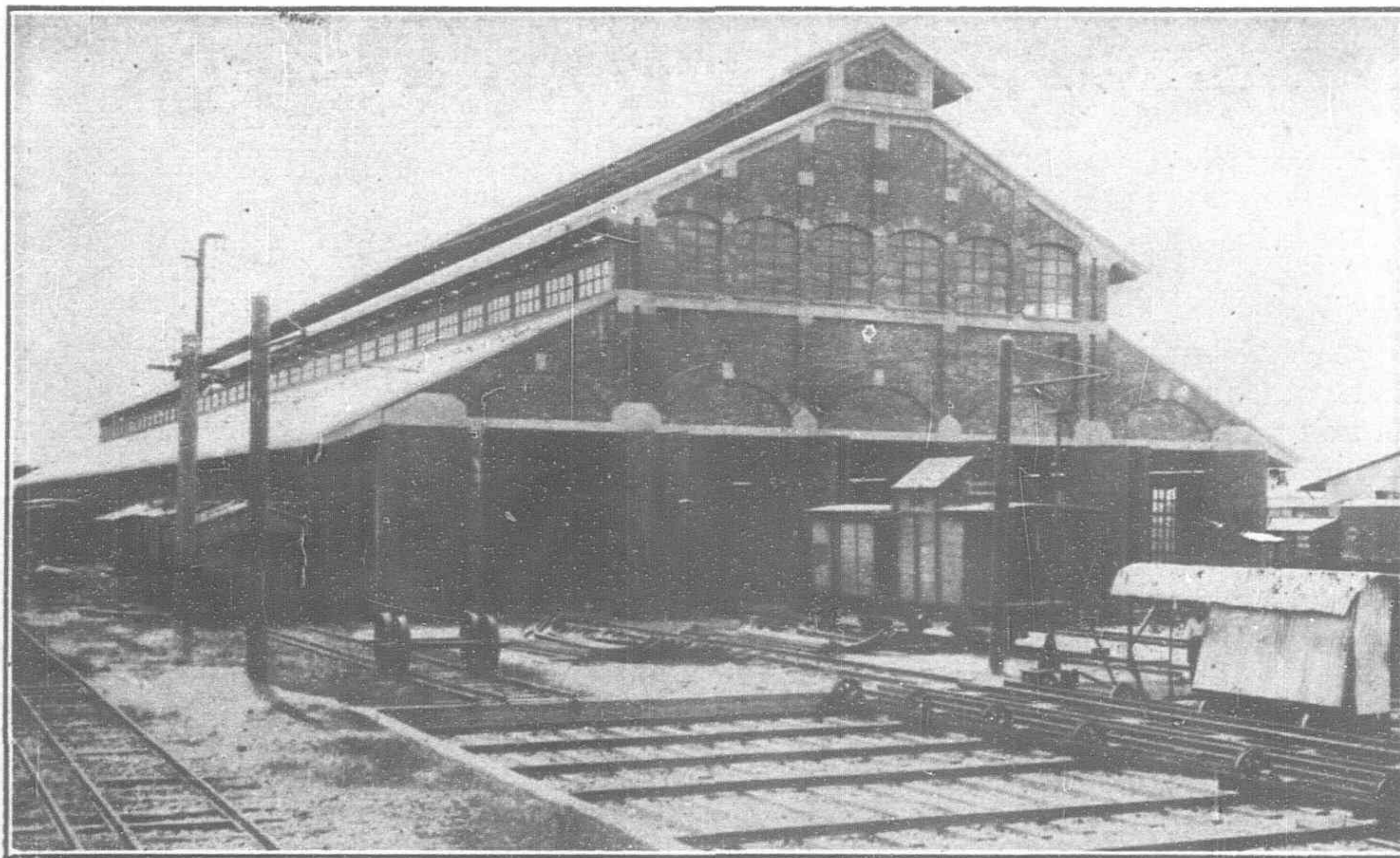
The smithy is 60 metres long and 14 metres wide and is equipped with 4 single fires, 12 double fires and 2 spring furnaces: 5 steam hammers varying from 2 to 10 cwt. are installed. The blast for the fires is generated by two 24-inch "Allday's" simplex fans, motor driven. A "Buckton" spring scragging machine is provided.

The foundry is 36 metres long and 22 metres wide and is equipped with 2 cupolas for melting iron and a battery of 3 furnaces for melting bronze, etc. One of the cupolas is capable of melting 3 tons per hour and the other 1½ tons per hour. In addition a sand grinding mill is installed.

The electric, brass, wheel, welding, motor, coppersmith and outstation shops are carried under one roof, 50 metres long and 30 metres wide, portions being divided off for the various occupations carried on. With the exception of the welding and wheel shop there is no machinery of note in this building, the majority of the work being done by hand. In the welding shop a "Wilson" arc welder for 2 operators is installed and also an oxygen acetylene welding plant. The wheel shop contains a "Berry" 200-ton hydraulic wheel press.

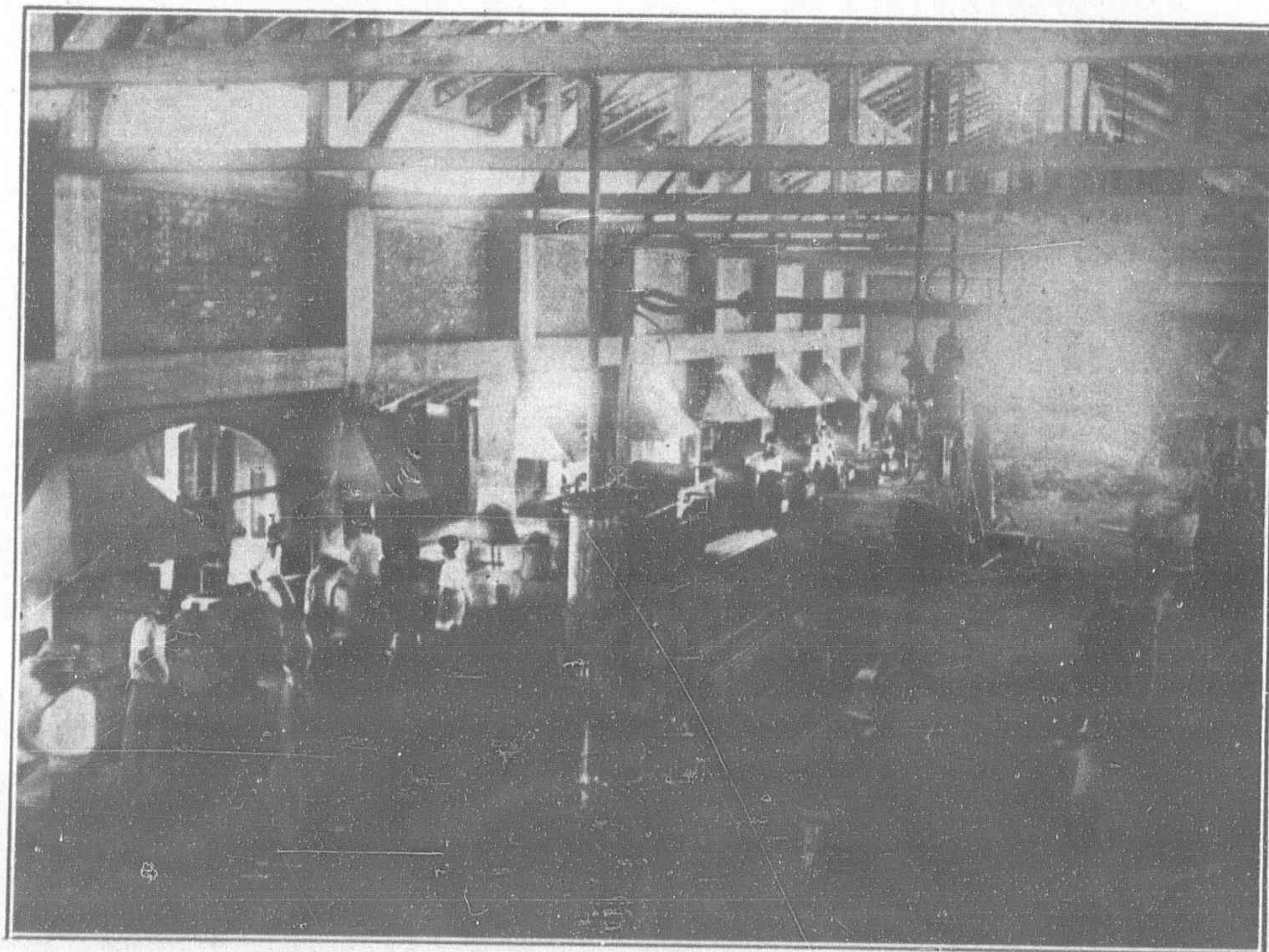
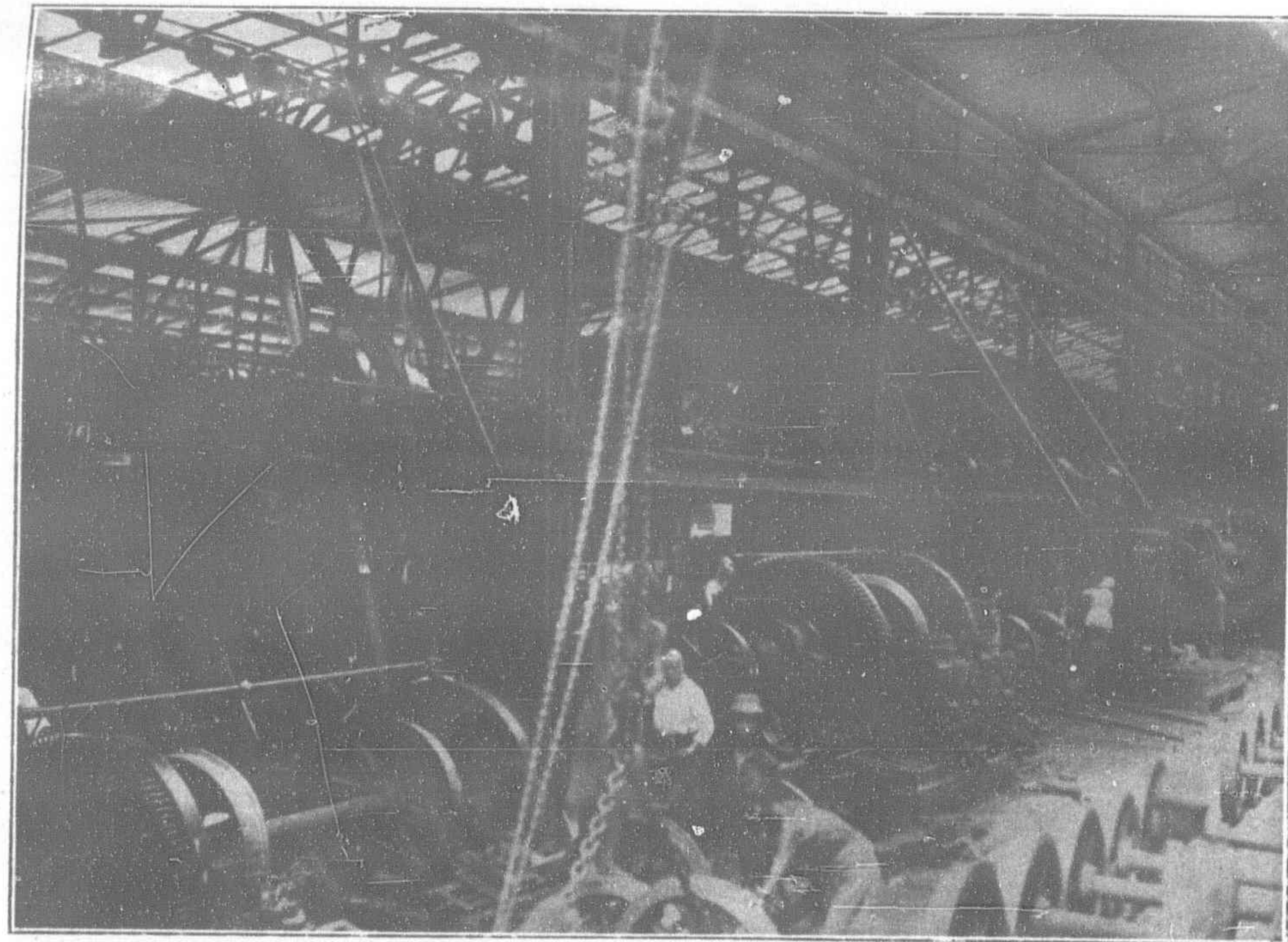
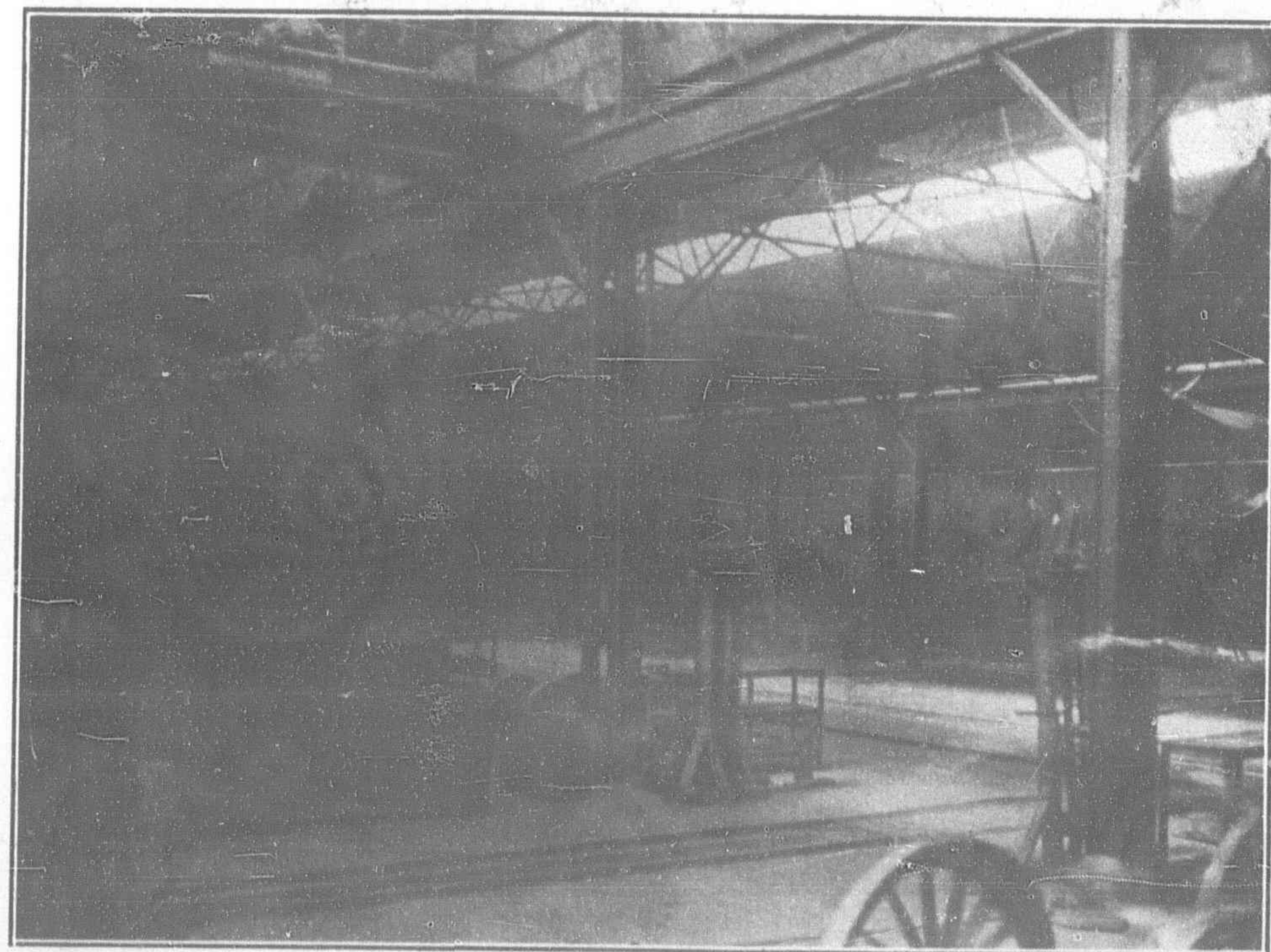
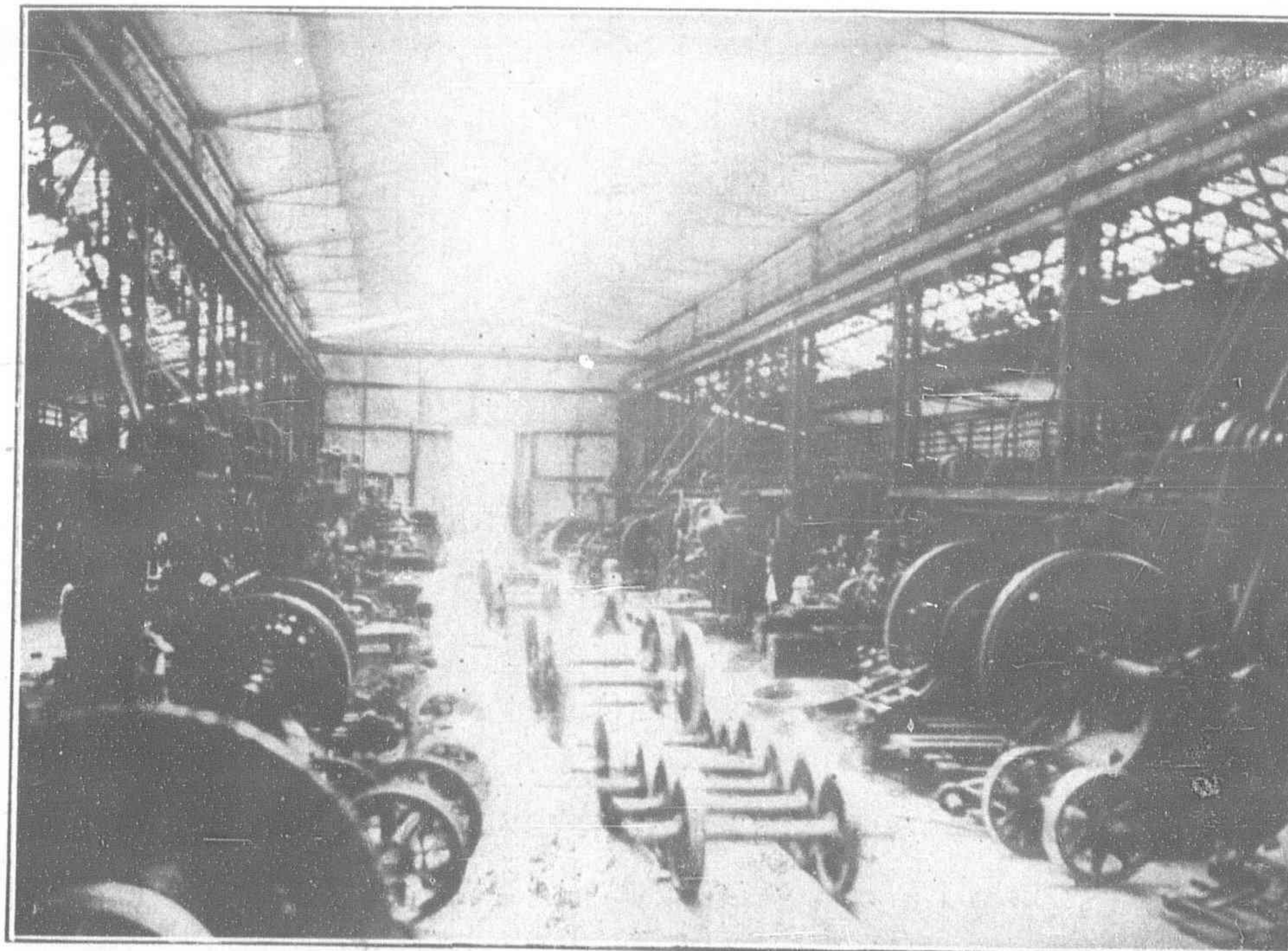
### Carriage and Wagon Shops

The old carriage and wagon shop is 125 metres long and 57 metres wide, containing 17 sets of rails. One end of the shop is used as a sawmill and woodworking machine shop and the opposite end as a paint shop, the former contains some excellent examples of modern woodworking machinery made by Thomas Robinson & Son.



The main Workshops of the Siam State Railways at Makasan, about 5 kilometres from Bangkok. These Workshops are equipped with up-to-date machinery driven by electric power, and employ approximately 1,000 men. Besides usual repairs to locomotives, carriages and wagons and miscellaneous Railway material, new carriages and wagons are built at these Workshops.





MAKASAN WORKS OF THE SIAM STATE RAILWAYS  
Top: Two Views of Machine Shop

Bottom: Smithy

Erecting and Boiler Shop





Interior of New Carriage and Wagon Shop

18 inches 6, 15 inches 4, 12 inches 4, cutter high-speed planing and moulding machines, duplex vertical spindle moulding machine, tennoning machine, mortising machines.

In addition to the above there are a considerable number of circular saws, hand planers, frame saws, saw sharpeners, etc., by various makers.

The centre portion of the shop is used for the repairs of carriages and wagons. The paint shop is equipped with paint grinding mills, etc. The exteriors of all passenger carriages are stained light brown and afterwards varnished with "Ningpo varnish." It has been found that this withstands the effects of the climate better than anything else, and has a pleasing appearance.

The new carriage shop is 129 metres long and 29 metres wide containing 5 sets of rails running lengthwise. The inner roads are used for building new carriage bodies and the outer roads for new goods stock. Two 15-ton "Craven" electric traveling cranes run along the centre length of the main bay.

The carpenters' shop is 30 metres long and 40 metres wide. In this shop all light carpentry, pattern making and cabinet making is done; a portion is reserved for the carriage trimmers. The shop is equipped with a few small woodworking machines, viz., chain and chisel mortiser, ripping and crosscut saw, circular saw, band saw, patternmakers' lathe, jig saw, etc.

## Sterilization of Water by Chlorine

**T**HE importance of the purity of water is well-known to be one of the most vital necessities, and as in many parts of the world it is practically unprocurable and in consequence health is menaced, the use of chlorine for sterilization purposes is coming into greater prominence.

The eighteenth annual report of Sir A. C. Houston to the metropolitan water board (London, Eng.), which has just been published, contains some illuminating figures relative to the use of chlorine in the purification of domestic water supplies.

During the twelve months, ended March 31, 1924, as much as 24,277 million gallons of Thames river water was dosed to the extent of one part of chlorine to 2.42 million parts of water. This effected a better result than storage in the Staines reservoirs for a month, and moreover, effected a saving of £14,200.

This treatment has now been applied for eight years, during which time 185,000,000,000 gallons of water have been treated with a gross calculated saving of nearly £120,000. The average dose of one part of chlorine to 2.3 millions of water produced waters from which 78 per cent. of the samples taken showed no B. coli in 10 c.c. of water.

For the treatment of new river water 5,237,000,000 gallons cost but £388, and it is stated that it is now possible to remedy bacteriological deterioration due to winter floods without giving rise to taste troubles. Chlorination effected a reduction during the flood months of November, December and January from 40 per cent. to 14 per cent. of samples containing B. coli, and this in spite of an increased general impurity of the water as indicated by the increased average raw water color from 58 to 95.

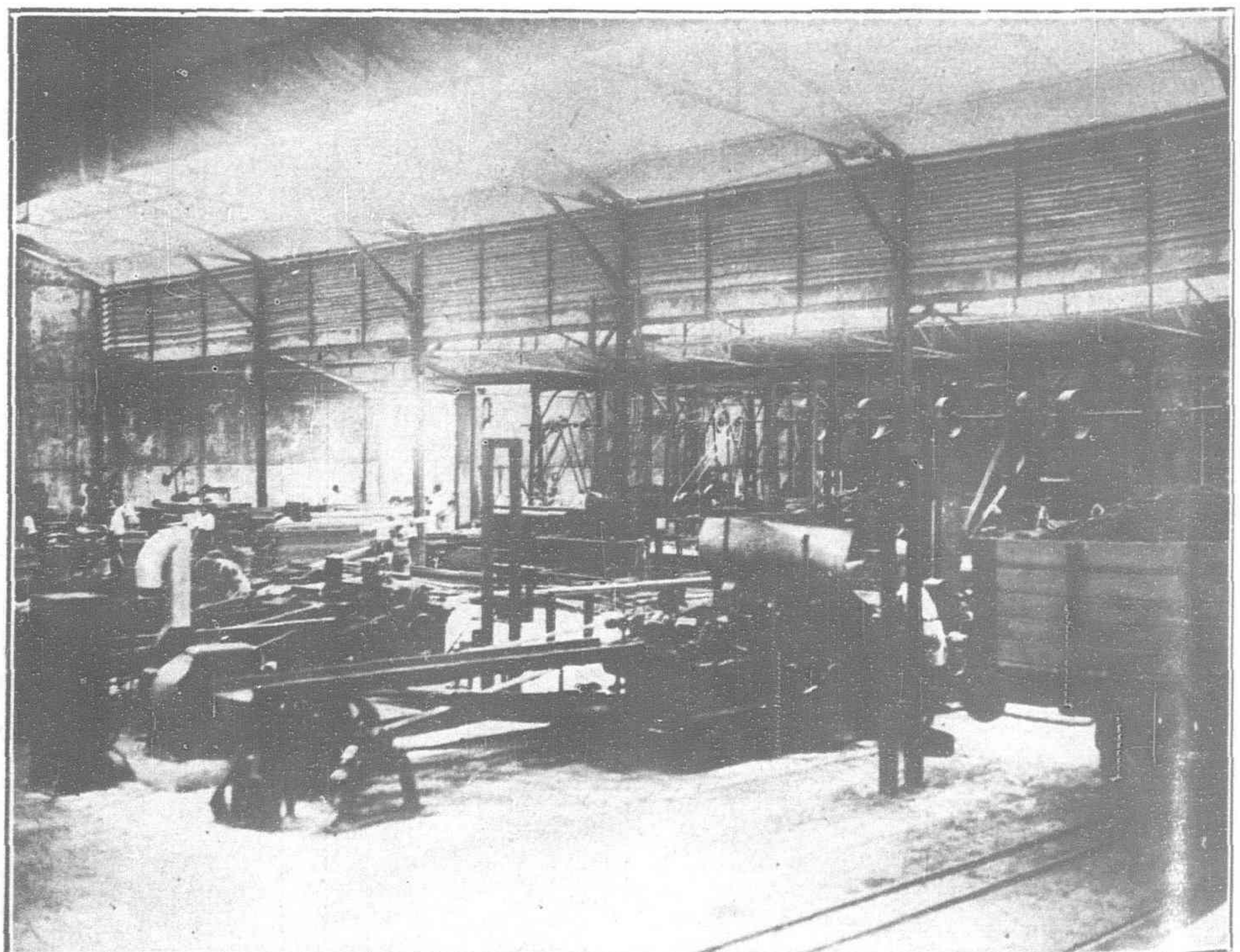
Super-chlorination followed by dechlorination has also been experimented with. Here the superdose of chlorine is 1 in 500,000. Quick sterilization is thus effected with the production of water showing no B. coli in 100 c.c., the excess of chlorine being then removed, thus avoiding the taste trouble.

This undoubted proof of the value of the system, should find a pronounced echo in the Orient, in cases where water is of inferior quality, or in any way liable to contamination.

## G. E. Projectors on Chinese Railways

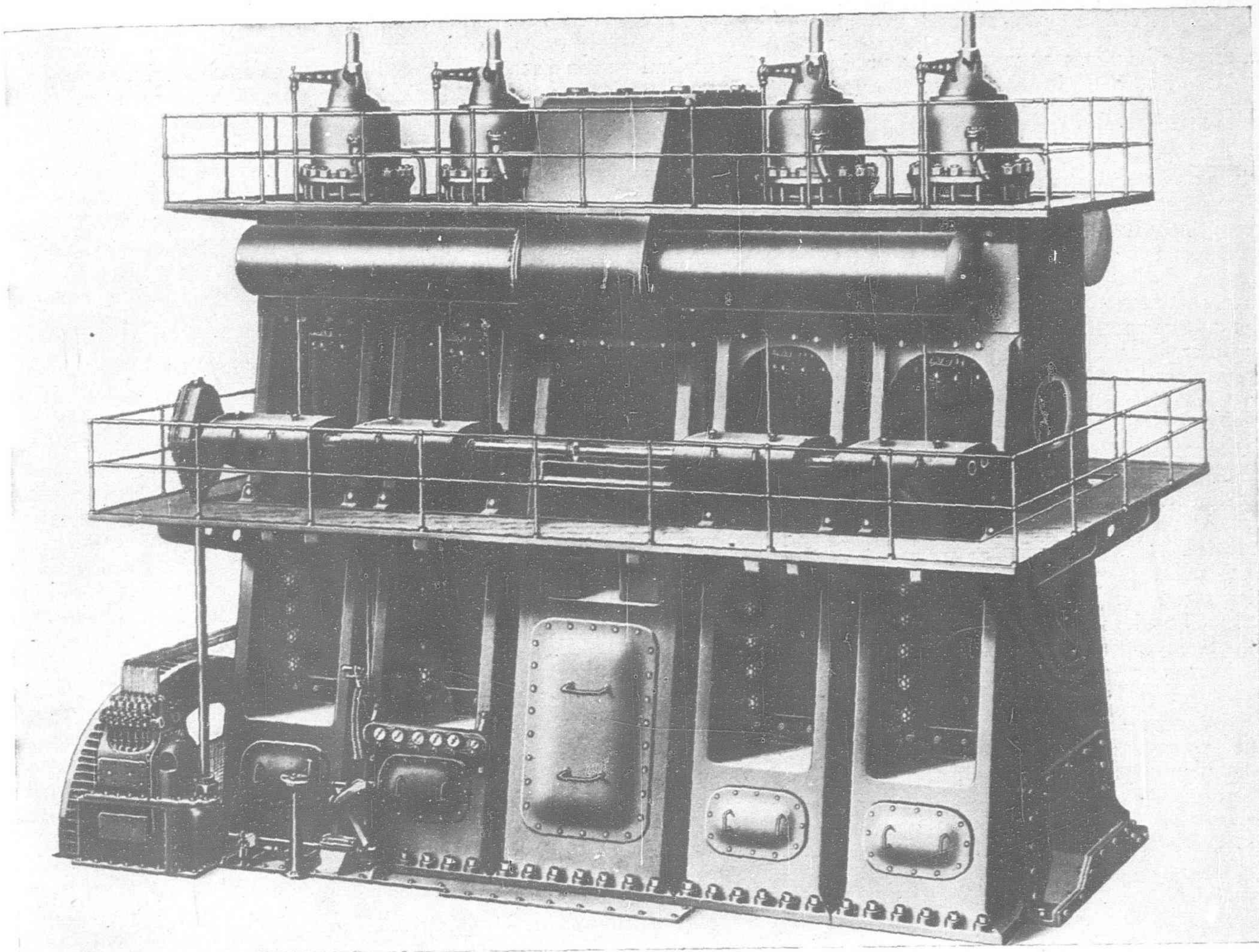
Floodlighting projectors for use on railroad cars carrying Chinese soldiers sent out to repel bandits have just been provided by the International General Electric Company.

The floodlighting projectors were equipped with 250 watt Mazda lamps, and a considerable number of these projectors were mounted on several railroad cars used to transport detachments of soldiers. Good work was done by this means in reducing the number of bandit attacks upon railroad trains of the Tientsin-Pukow railway.



Wood-working Machine Shop. All kinds of timber is machined here for use in the construction and repair of rolling stock. This shop is adequately equipped with up-to-date wood-working machines





## A Diesel Engine Achievement

American Designed Two-Cycle Double Acting Engine Marks a New Epoch  
in the Development of Internal Combustion Prime Movers

**W**E are now in a position to announce the completion of what is recognized as being the first exclusively American design of a two-cycle double acting Diesel oil engine. This new engine is the outcome of four years of intensive development work on the part of the Worthington technical staff, a prominent member of which is C. E. Jorgenson, a Diesel engineer of international reputation.

One of the outstanding advantages of this engine is that the horse-power produced per cylinder can from all indications be carried to a far higher value than has as yet been attained in any other make of Diesel engine, and this feature alone immensely increases the field of possible usefulness of this type of power producer, and renders it an active competitor of steam-driven power machinery throughout a much wider range than has heretofore been found possible.

This new Diesel Worthington engine was wholly designed and built in America. Behind it is the Worthington's twenty-four years of experience in designing and building internal combustion engines the last four years of which, as intimated above, have been applied to intensive research, study and experiment aimed directly at the production of the results which have now been realized. Dr. C. E. Lucke, professor and dean of mechanical engineering of Columbia University, N. Y. City, U. S. A., who has been in touch with the development of this Worthington engine, has made the following statements relative to same:—

"It is a new Diesel engine design. Previous types of Diesel engine started with an engineering idea which was embodied in an

engine. This one started with an analysis of the practical requirements of the ship, followed by a deliberate purposeful effort to create an engine to meet those requirements.

"The requirements were,—an engine of minimum cost per horse-power to build,—one that would fit into engine-rooms that had been built for steam machinery, without too much reconstruction,—and one that would run at about the same speed as the steam engine, and hence use the same shaft and propeller.

"The answer to these problems is known as a double-acting two-cycle Diesel engine. Without going into technicalities, this means that whereas previous types of Diesel engines installed in ships deliver power, in the four-cycle single-acting type on every other down stroke of the piston, and in the two-cycle single acting type on every down stroke,—this engine delivers power as a steam engine does, on every down stroke and every up stroke.

"It is easy to see that to get the same amount of power from an engine cylinder in which the power is delivered only one-fourth of the time, it must be larger than one in which power is being exerted all the time,—and the engine including this cylinder and its accompanying mechanism will cost much more to construct. The difficulties in the way of earlier adoption of this double-acting idea were largely due to the heat generated in the cylinder, which is very great in large engines, so great as to require special provision to prevent injury by overheating the cylinder.

"To tell how the difficulties of incorporating these ideas into a practical engine, were overcome, would make a story too long and too technical to be told now. Suffice it that the Worthington corporation, which built the first Diesel engine in America—twenty



years ago—has evolved a wholly American design that overcomes these difficulties."

Worthington has been engaged in the production of American Diesel engines since 1912, in which year the first wholly American design of engine of this type was developed in the company's works at Buffalo, N. Y., U. S. A. Nearly 100,000 horse-power of Worthington Diesel engines are now in active service in the United States. The Worthington type of gas engine has been in use since 1900, and at the present time over a quarter of a million horse-power of such engines, including the largest double acting gas engines ever built anywhere, are in use.

The principal inspiration back of the four years research campaign recently concluded was that there had grown up a strong demand for a new type of engine that would overcome the numerous handicaps inherent in the character of existing Diesel machinery. The problem placed before Worthington engineers was to produce an engine possessing all the advantages of the Diesel engine as regards fuel consumption and general operating economy, and which at the same time would approach in dimensions, weight and speed close enough to steam-driven machinery to permit of its substitution for steam engines in ships that had already been built and at costs that would not be prohibitive either for the engine or for the installation.

Another point of great importance also was the matter of manœuvring qualities. A marine engine must be capable of being started, stopped and reversed quickly and with ease and certainty of control. It is well known that the last mentioned qualities constitute the reasons why the reciprocating steam engine has so long held its ground in competition with both the steam turbine and the Diesel engine for ship propulsion.

The basic principle underlying the new Worthington Diesel engine in comparing same with the current types of four-cycle and two-cycle engines, is that whereas in the first type there is only one power stroke in every four strokes made by the engine, and in the second case only one power stroke for every two strokes of the engine, the design of the new type of Worthington Diesel engine is such that every stroke of the engine is a power stroke. Therefore its working cycle is very much the same as that of a reciprocating steam engine.

While this principle is not entirely novel its successful application has hitherto been interfered with by mechanical difficulties caused by complicated heat stresses that are present in the cylinders of double-acting Diesel engines. Consequently the success of the new Worthington design is wholly based upon the manner in which the problems of expansion and of heat removal have been solved therein.

The complete solution of this problem having been accomplished, the extraordinary advantages of the double-acting type of Diesel engine are at once brought out in greater prominence. The serious difficulties heretofore encountered in satisfactorily balancing the moving parts of the engine are thereby entirely removed. The saving in weight of moving part by distributing the power development through four strokes instead of concentrating same in one stroke is an important improvement also, because of the decreased provision needed to care for the momentum of these parts.

The cylinder of this new Worthington Diesel engine may be described as composed of two single-acting cylinders opposed end for end, the power in each being exerted in opposite directions upon a double end piston which is flanged to one rod. Scavaging and exhaust ports, cooling water circulation and expansion provisions of the two cylinders are independent of each other. Thus it will be seen that the design is exceptionally simple and follows in all respects the best modern standards in Diesel engine practice.

The plan adopted for insuring the maximum strength and rigidity in cylinder construction, combined with the necessary freedom for expansion and uniformity of heat transference as well as constructive economy in the use of materials, are especially simple and effective. There are three fuel spray valves, one being located on the top of the upper end of the power cylinder, and the other two being located in the lower end of the power cylinder. Great ingenuity is shown in the admirable manner in which the two latter valves are operated in providing a uniform and symmetrical distribution of the fuel discharge around the piston rod.

The reversing mechanism, as a point of interest, is second only to the unique cylinder design. Each of the three fuel valves

has its individual cam and all three are geared to the same shaft. The cams are symmetrical. All that is necessary to reverse the running direction is to shift the three cams simultaneously through 34 degs. on the shaft. This is accomplished by a worm shaft which is actuated by an oil operated mechanism controlled by a 4-way cock, this in turn being operated by a single lever on a manœuvring platform.

The engine is started and stopped by this single lever which as it is moved forward opens successively the air starting valves, and then the fuel supply valves, while simultaneously closing the air starting valves. The lever can then be set by a ratchet and pawl at any desired rate of fuel supply. To stop the engine, all that is necessary to do is to throw back the lever mentioned to the stop position. The starting and stopping lever and the reversing lever though independent of each other in all other respects, are interlocked so that the engine must be brought to a full stop before it can be reversed. The manœuvring control is therefore as practical, simple and effective as in the case of the reciprocating steam engine, and it is much more prompt and positive than it is in the case of a steam turbine. The possibilities of this positive, quick-operating reversing gear appeal to marine engineers almost as strongly as the important improvements that have been made in the cylinder construction as described above.

In keeping pace with the development of the Diesel-engine driven ships versus those of the steam-engine driven type, almost insuperable difficulties have heretofore been encountered in efforts to change over existing vessels of the latter type to Diesel drives. The advent of the new Worthington Diesel engine has created a totally different situation in this respect. Heretofore the great weight, the space occupied, the cost of existing types of Diesel engines for ship propulsion and a lack of manœuvring qualities have had the effect of rendering the margin of operating profit resulting from conversion so low as to provide very little inducement to the investment of capital in such conversions.

In most cases the cost of removing the steam machinery, the first cost of the Diesel engine, the possible sacrifice of cargo capacity and the cost of more or less extensive changes in the ship's structure acted as serious deterrents against the conversion of steamships into Diesel ships.

Worthington engineers believe that all of these difficulties have been completely overcome by the evolving of an engine having the fuel economy and other operating advantages of the Diesel oil engine, and in which at the same time are embodied the simplicity of design, the lower first cost, the moderate weight, the economy in space occupied, and the facility of manœuvring control that are possessed by the best type of steam-driven reciprocating engines. This means then that the conversion of steam-driven ships to Diesel-engine driven ships can now be easily effected without any important changes in the ships themselves, in many cases without even changing the existing shaft and impellers, and often with an actual increase in cargo space.

One of the first effects of the advent of this new Worthington Diesel type of engine will be the strong impetus that is thereby made possible in converting and placing into the world merchant marine trade over a thousand American ships originally designed for steam-engine drive, and that are now laid up in idleness because they cannot be profitably operated under present conditions.

The usefulness of the new Worthington Diesel engine will by no means be confined to shipping however. The same simplicity of design in larger sizes are expected to commend them for many uses on land in isolated power plants, in pumping stations in various industrial plants, in supplementary or "stand-by" power plants needed on hydro-electric service when water supplies run low at certain seasons of the year, etc.

This new double-acting Diesel engine, especially adapted as it is to building in larger sizes, renders it possible now to realize in the larger installations the same advantages and economical value that the smaller sizes of Diesel engines operating "single acting" have already so conclusively demonstrated as practicable.

The consensus of opinion on the part of engineers who have investigated the subject is that in the design and construction of this new type of Diesel engine, Worthington have inaugurated a new era in the production of power by Diesel engines, the influence of which it would seem is certain to have a world-wide effect.

D. J. GIBSON.



# Mining Progress in N.E.I.

THE jurisdiction of the Netherlands East Indies bureau of mines extends over the following activities, geological surveying, vulcanology, prospecting for useful minerals, carrying on researches of mineralogical and metallurgical nature, locating and sinking wells for drinking water in deep layers, organizing and managing state mining industries and exercising regular legal supervision of private mining enterprises. The government mining industry includes the collieries at Sawah Luntoh, at Tandjong (Sumatra) and at Pulu Laut, an island off the south-east coast of Borneo, further the tin mines on the island of Banka and the gold and silver mines in Benkulen (Sumatra).

Private concerns, wishing to exploit minerals, must obtain a license to prospect a concession; both these are subject to certain conditions regarding domicile of the owners during the concession period, government taxes, security, transfer and government supervision, set forth in the mining act of 1898, as revised in 1910 and again in 1919. According to this latest revision, aside from rights already granted, no more concessions will be granted to private individuals for anthracite and all kinds of bituminous coal and lignites, petroleum, asphalt and all other kinds of bituminous substances, solid as well as liquid, and inflammable gases, the latter as far as they are not of recent origin marsh gases and also iodine and allied substances obtained from salt deposits or mineral springs.

The minerals named before may henceforth be exploited only by the state itself, or by private parties in possession of an exploitation agreement with the government, on the basis of article 5a of the Dutch

East Indies mining act, which agreement may only be signed by power of attorney fixed by law.

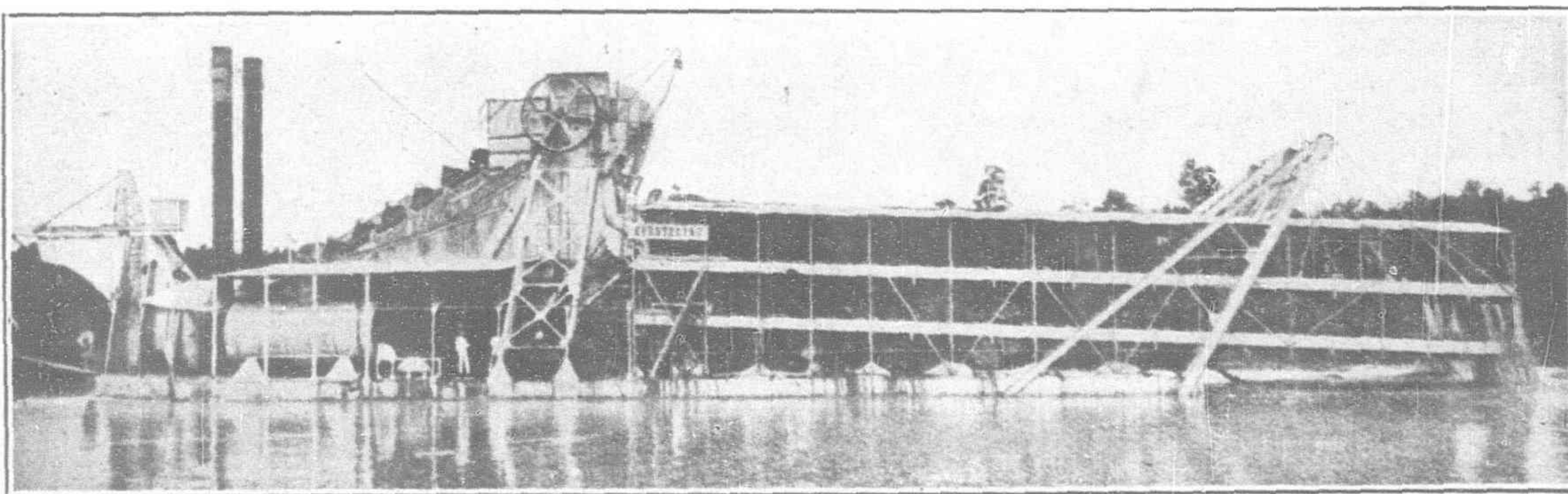
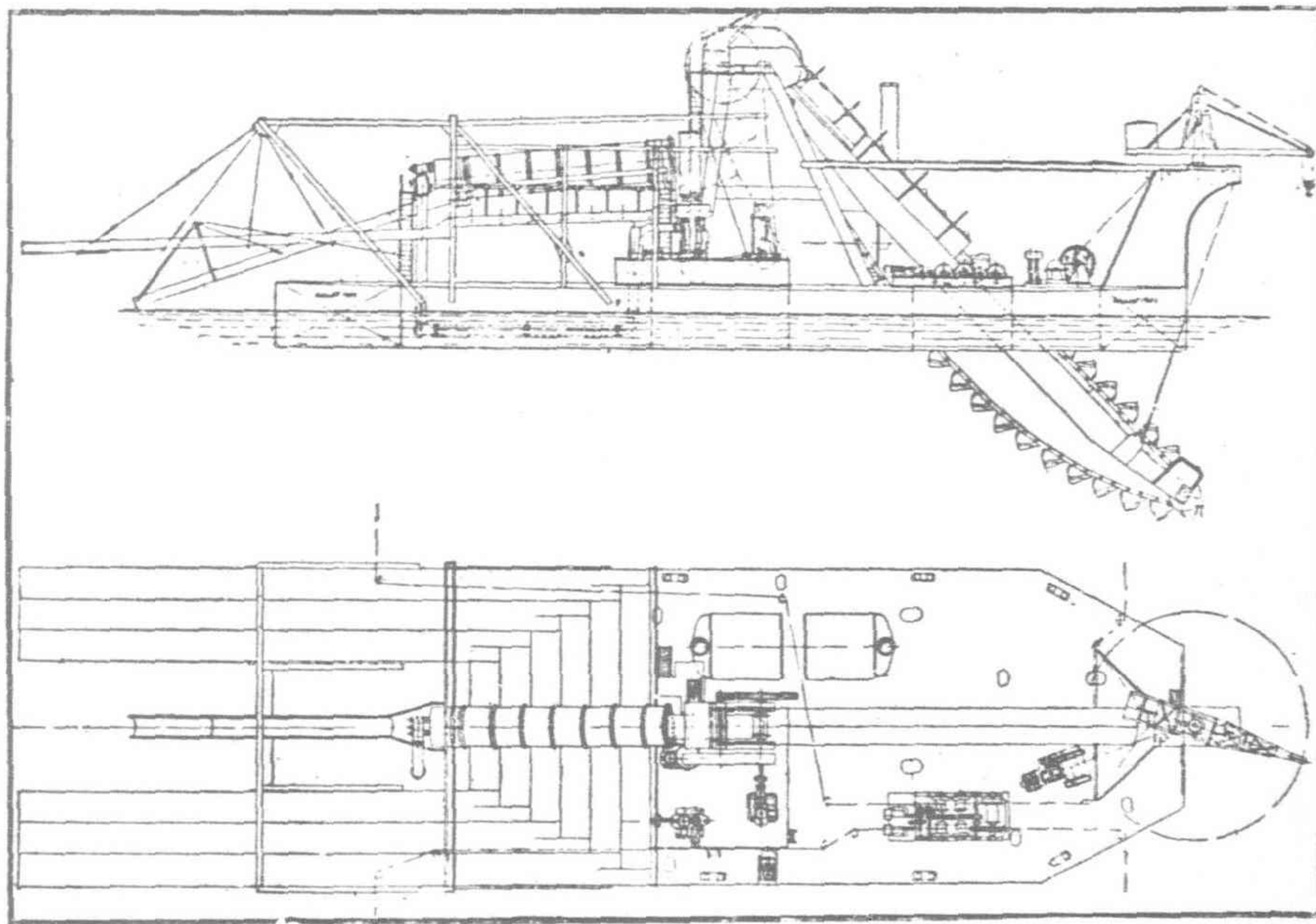
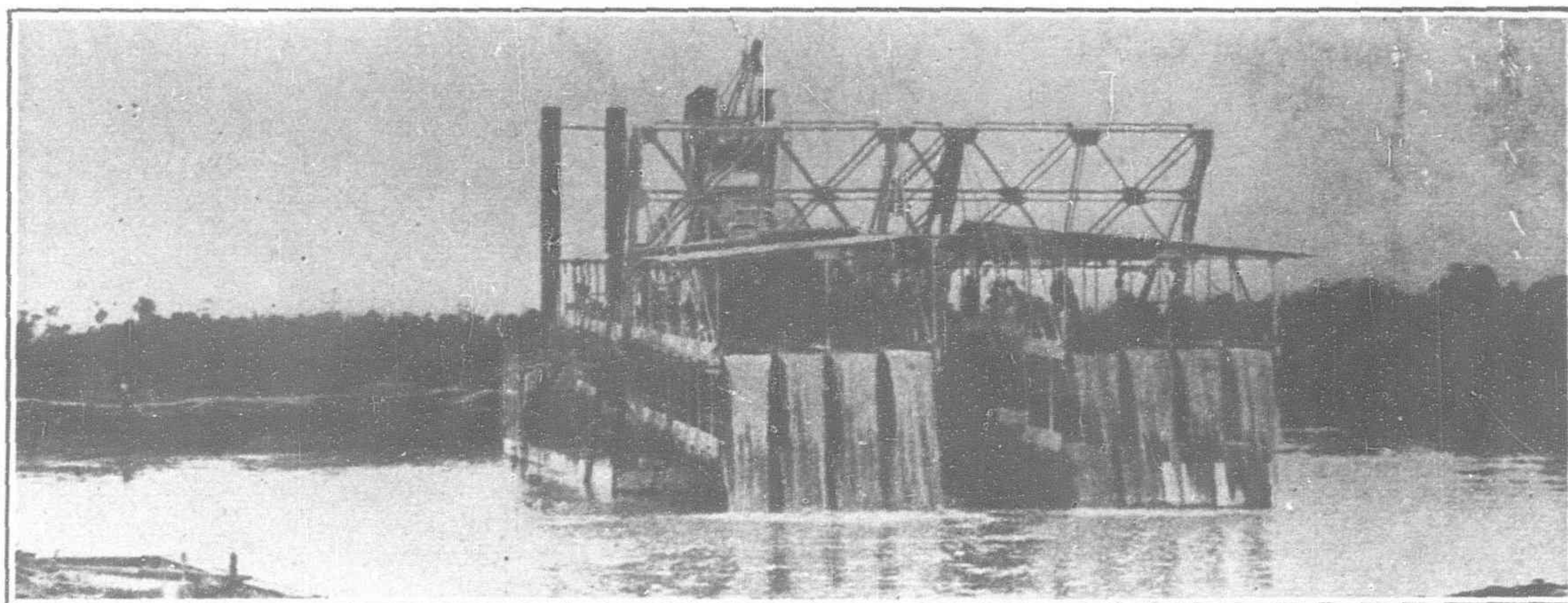
Concessions for the remaining minerals are still granted on the old basis. The working of minerals not mentioned in the mining act, is also subject to a permit.

Connected with the head office of the mining service in Batavia is the mineralogical and geological museum of the East Indian archipelago, to which anyone, interested in the work, may obtain admission on application. There also, assays of minerals and ores are made for private persons.

The government tin mines, all of which are situated on the island of Banka, are the outcome of an agreement made for the

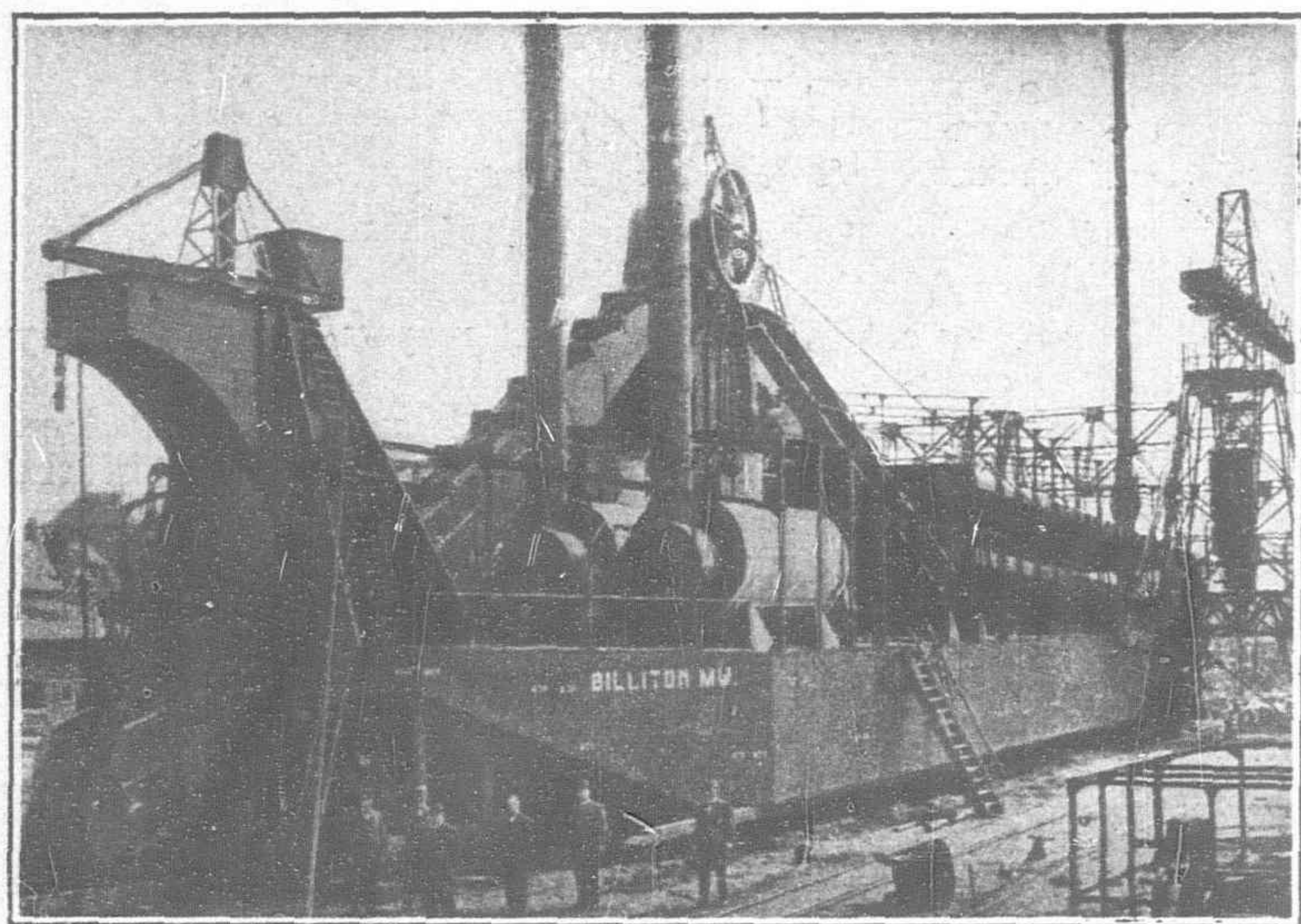
supply of tin by the former East Indian Company with the Rajas of Palembang, who, in those days, owned the island. The mining, which probably dates from 1710, was first carried on by the Malay population. Soon, however, the

Chinese took the industry in hand; in 1820 it was placed under European control by the Dutch East Indian government and since 1852 has been supervised by mining engineers, trained in Europe. Originally these engineers were entrusted only with the topographical, geological and mineralogical survey of the island, but they have since been put in charge of the actual mining and smelting operations. They have introduced important improvements in the construction of smelting furnaces, the drainage of the open cuts and the stripping of the overburden, so that the tin industry at Banka is now entirely up to date and is making use of the latest technical inventions. Moreover during the past few years the tin has been subject to a chemical test, before being exported, so



Type of Tin Dredge Employed on the Billiton Mines of the N.E.I. Government



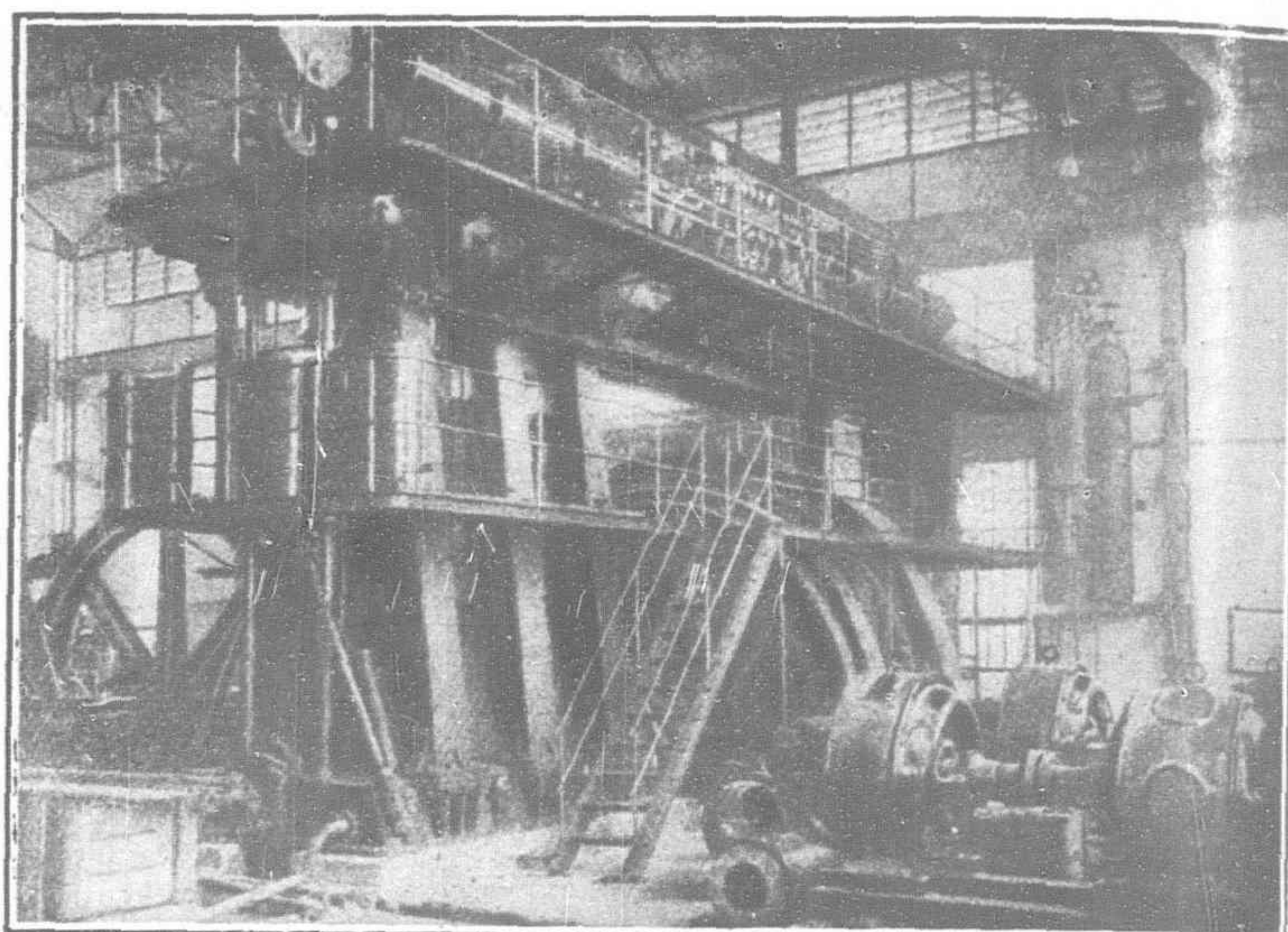


The Billiton Tin Dredge on the Slipway

that the Banka stamp guarantees the quality of the product. Banka tin is exceedingly pure, containing 99.9 per cent. tin and more, the balance being chiefly iron.

The island has an area of 12,240 square K. M. and extends over a length of 100 nautical miles. Most of the mines are situated on the north-east side of the island. The ore, which is found in the alluvial deposits of many riverbeds and in the alluvial strata on the slopes of small hills, is worked exclusively in open cuts. The deposits of some riverbeds extend for considerable distance into the sea, and accordingly some workings extend beyond the coast, this kind of exploitation being one of the interesting problems for the future. The strata, so-called "Kaksa," from which the ore is obtained, are from one-tenth to four-tenth metres thick, although in exceptional cases the thickness reaches several metres. The overburden ranging from about 5 to 20 metres, is chiefly removed by hand with the aid of mechanical transport or hydraulic sluicing, the latter being considered best for soft layers. This sluicing is aided by gravel pumps, partly of N. E. I. design, about 200 of which were in regular service in 1922, 66.87 per cent. of the excavated ground being handled in that way. A steam turbine driven by electric power plant of 6,000 kw. is installed for distributing power to the most important districts. The ore is first washed in sluices and is then generally smelted in simple blast furnaces called "Vlaanderen ovens." Each district has a central smelting-house for all the mines.

The manual labor is still done by Chinese coolies and is partly contracted for and partly carried out under the government's own management. In 1922, 13.5 per cent. of the world's tin production was obtained under government supervision. The average number of laborers (contract coolies) in 1922, amounted to 18,061. Since 1914 Banka tin has been sold almost exclusively in the Dutch East Indies. The tin is sold by private contract in Batavia, while a small part is supplied to various branches of service in Holland



Diesel Motor in the Manggar Electric Power House of the Billiton Mines

and the Dutch East Indies. The following table gives some figures regarding the tin industry in Banka :—

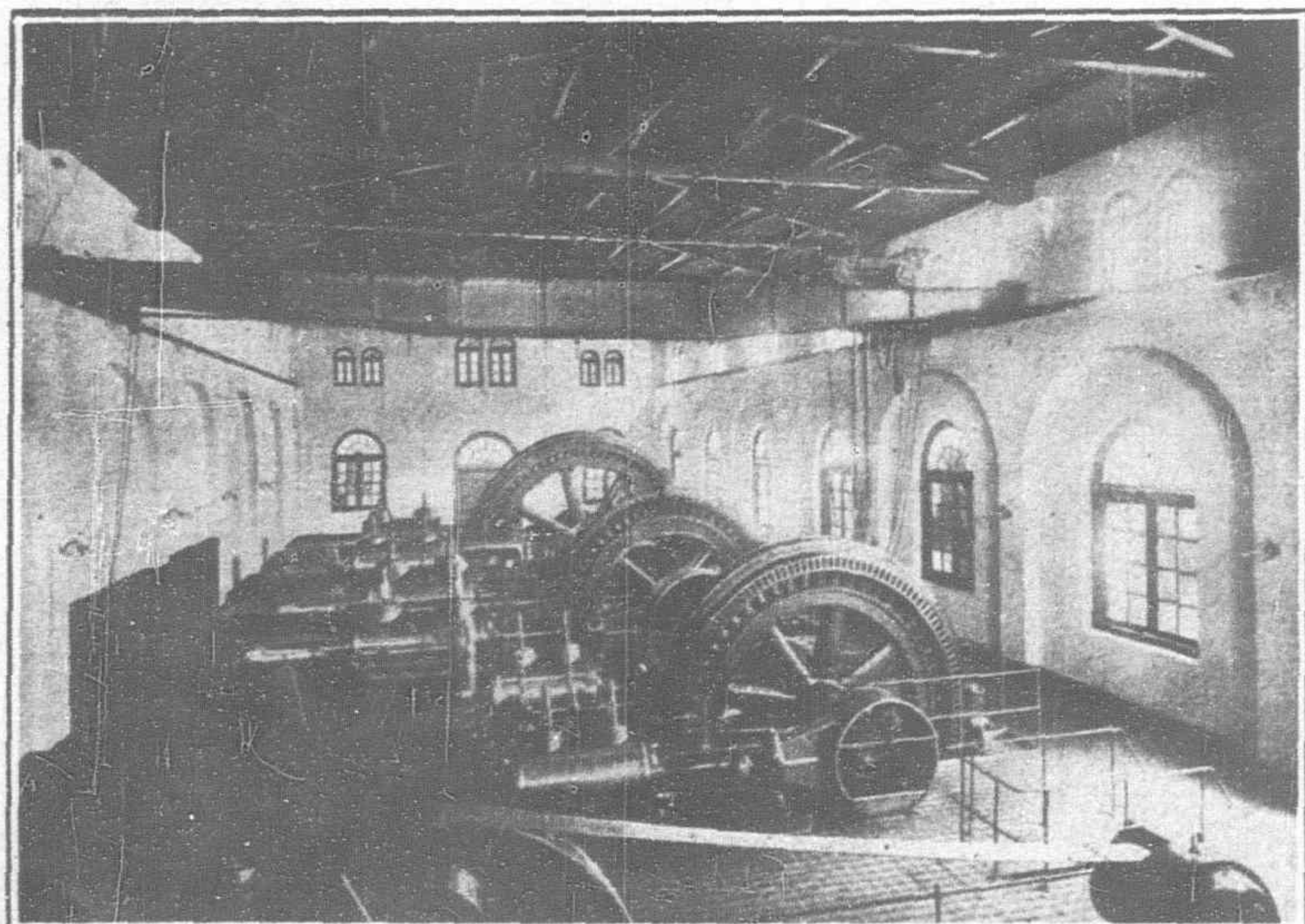
Year	Number of Mines	Average Number of Laborers	Production in Tons of 1,000 kg.	Quantity of Tin Marketed in Holland in 1,000 kg.	Quantity of Tin Sold in D. E. I. in 1,000 kg.	Cost Price of the Marketed Tin per pleul in Glds.	Average Selling Price in Glds.	Net Receipts of the Marketed Tin in Glds.	Net Profits of the Industry in Glds.
1919	311	18,129	12,404	904	15,254	63.01	182 176	46,227,847	29,682,893
1920	320	19,718	13,590	12	9,489	83.27	194 194	29,925,717	17,114,672
1921	324	19,254	15,142	—	13,971	93.00	— 113	25,685,458	3,308,602
1922	336	18,061	17,073	—	—	—	—	—	—

\*<sup>1</sup>Freight and selling costs included.

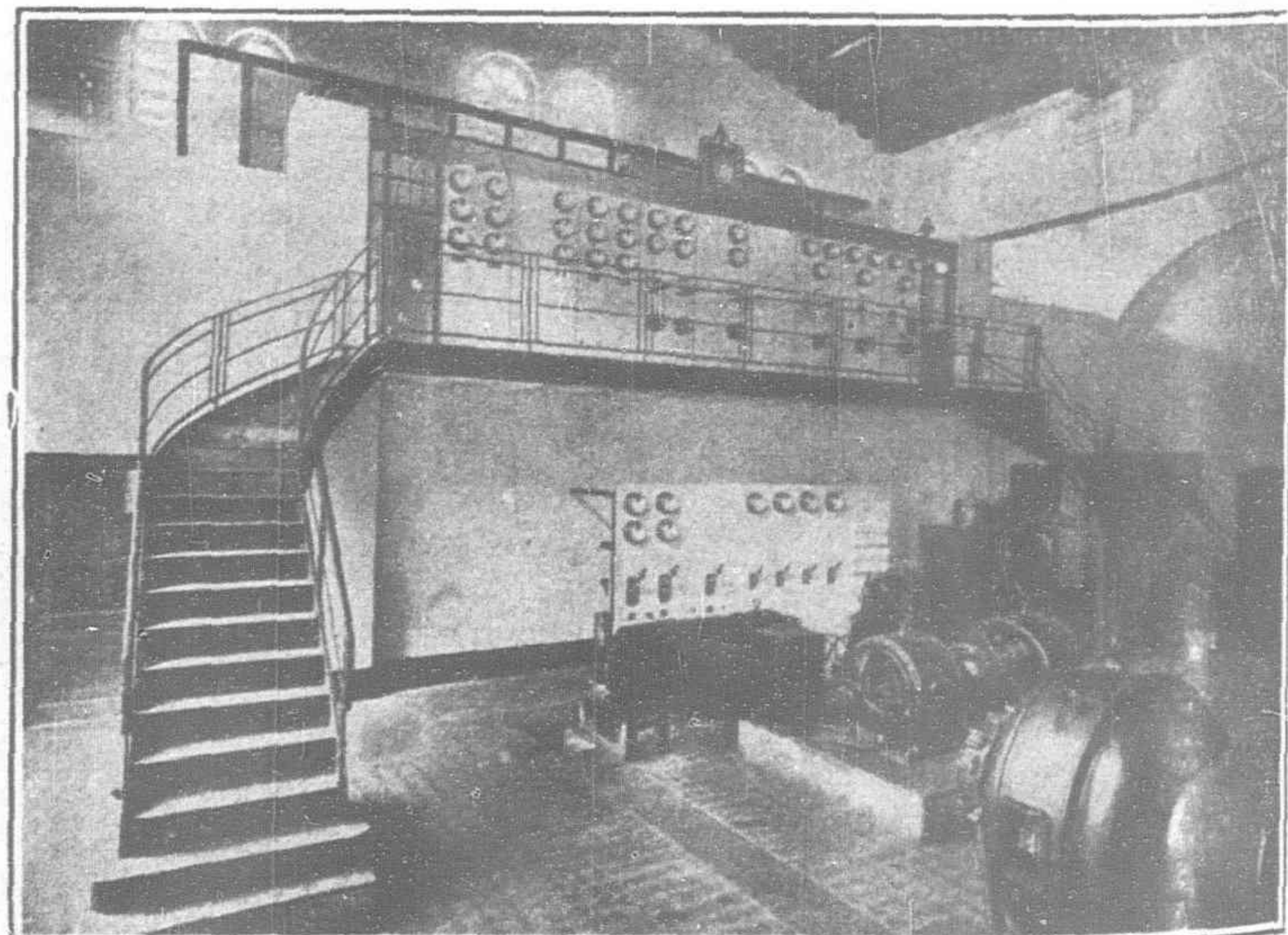
The chief private tin mines enterprise is that of the "Billiton Maatschappij," which works the tin in the island of Billiton. In 1852 a concession was granted to the Billiton Maatschappij, and in 1892 was extended for a further period of thirty-five years. In the new agreement it is stipulated, that five-eighths of the yearly profits goes to the government.

The geological formation and deposits of the ore are almost similar to those in Banka. In Billiton, however, are also found ore veins, which are rich enough to be worked, in alluvial deposits.

As in Banka, the work is done by Chinese "kongsies," working under contract, while the industry is organized along the same lines. Besides the regular manual labor and thereby appertaining mechanical appliances, also four suction dredges and one bucket dredge are in regular service. About  $\frac{2}{3}$  of the tin is mined by hydro-mechanical means. An electric power plant, driven by Diesel engines, generates the necessary power. In 1921 twenty six mines were in exploitation. As the date of expiration of the concession is approaching, a proposition has been made for passing a law entailing further exploitation of these tin mines for joint account with the government.



Generating Room and Switchboard of the Sawah Loento Power House

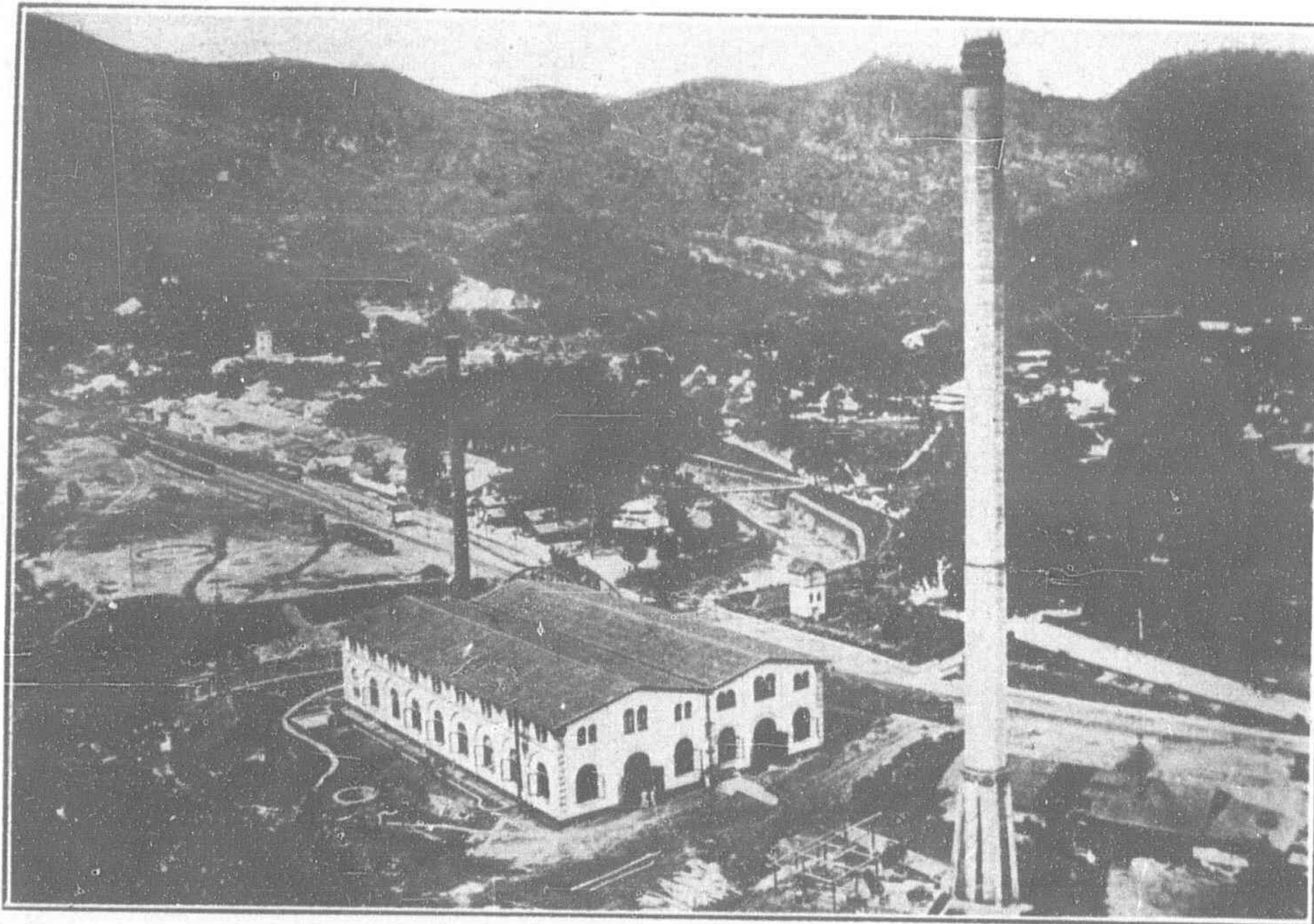




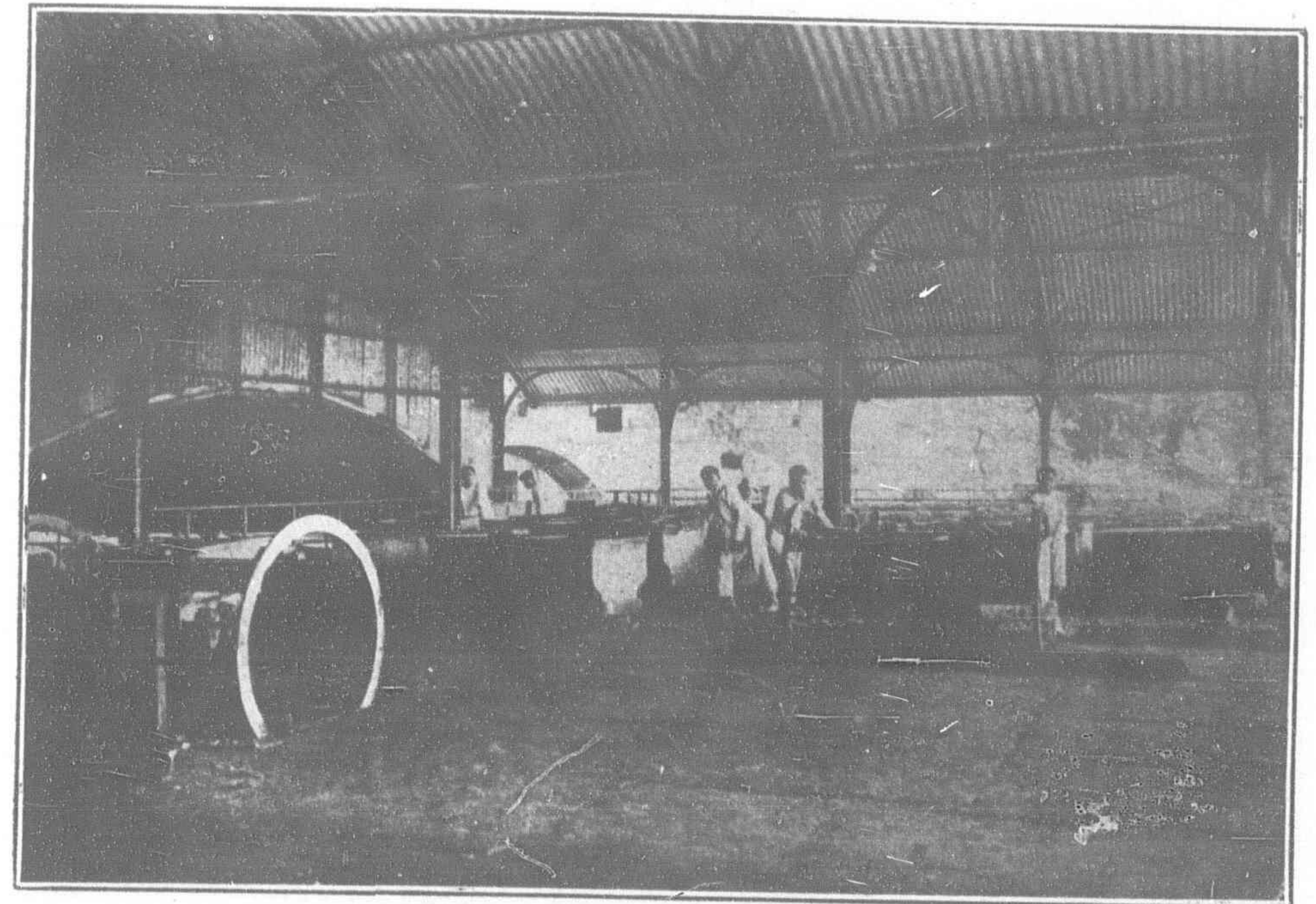
THE OMBILIN COAL MINES AT SAWAH LOENTOE, SUMATRA  
Operated by the N.E.I. Government and Producing Over 500,000 Tons Annually

November, 1924

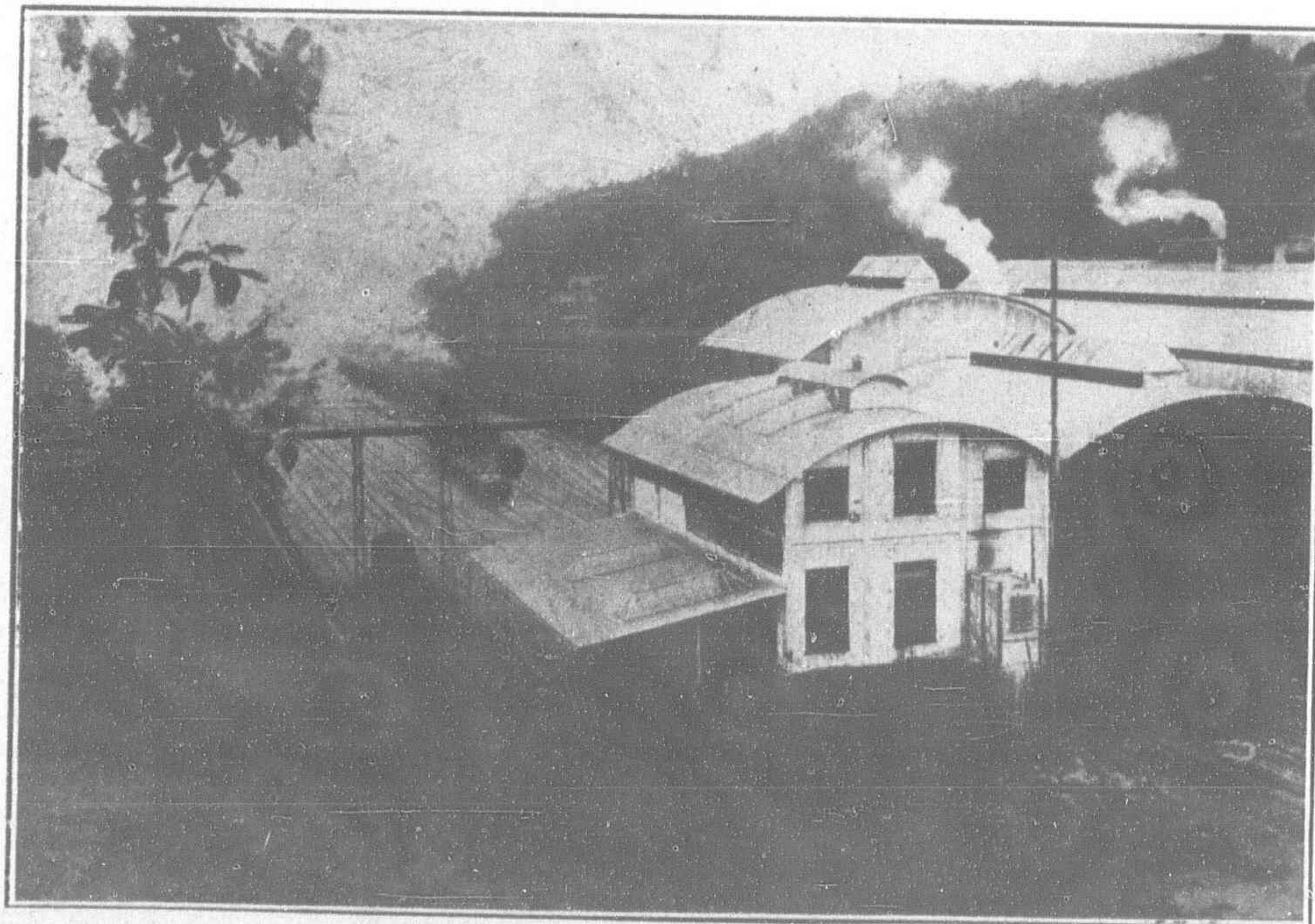
THE FAR EASTERN REVIEW



Electric Power Station



Interior of Coal Dressing Plant

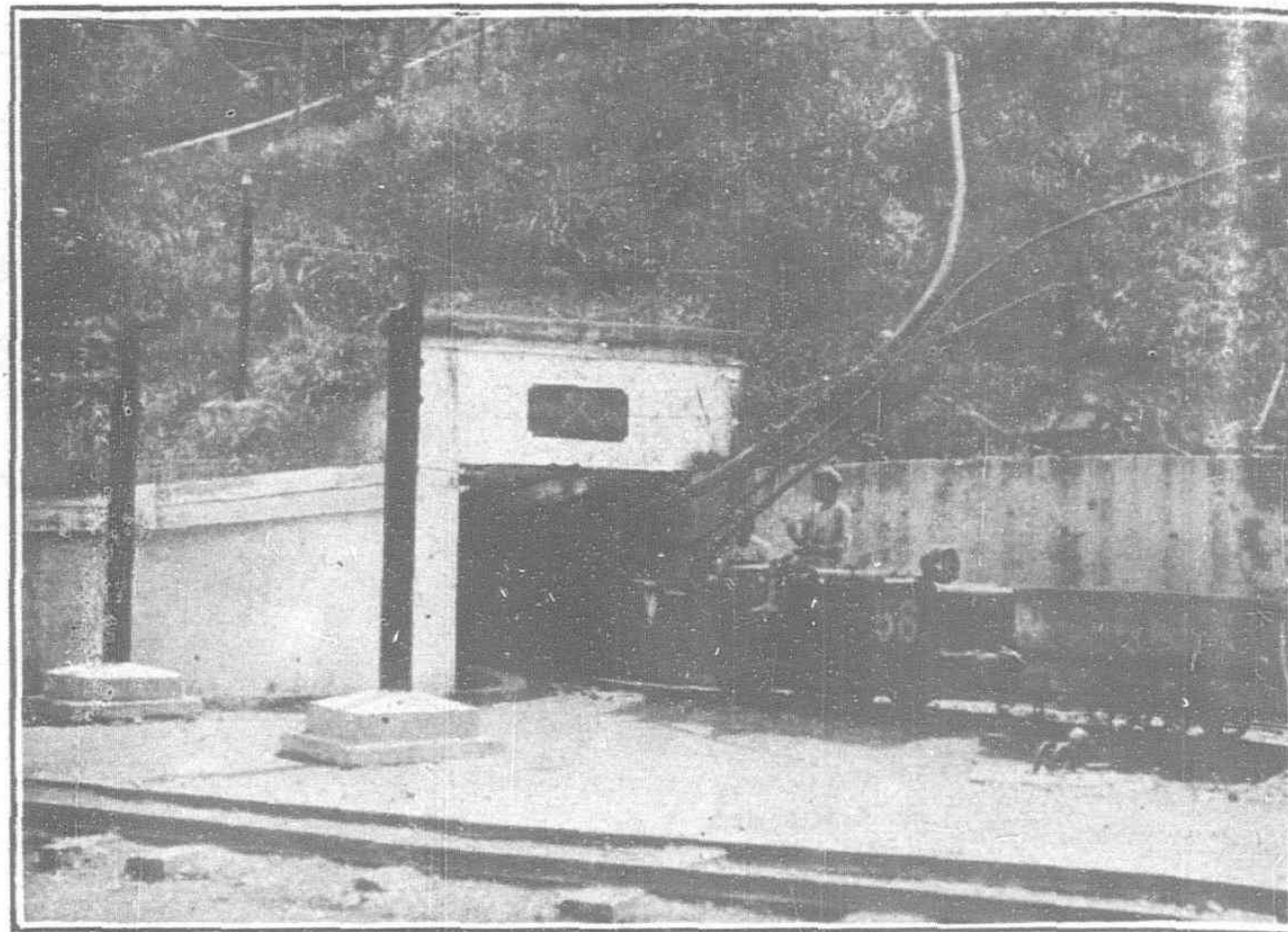
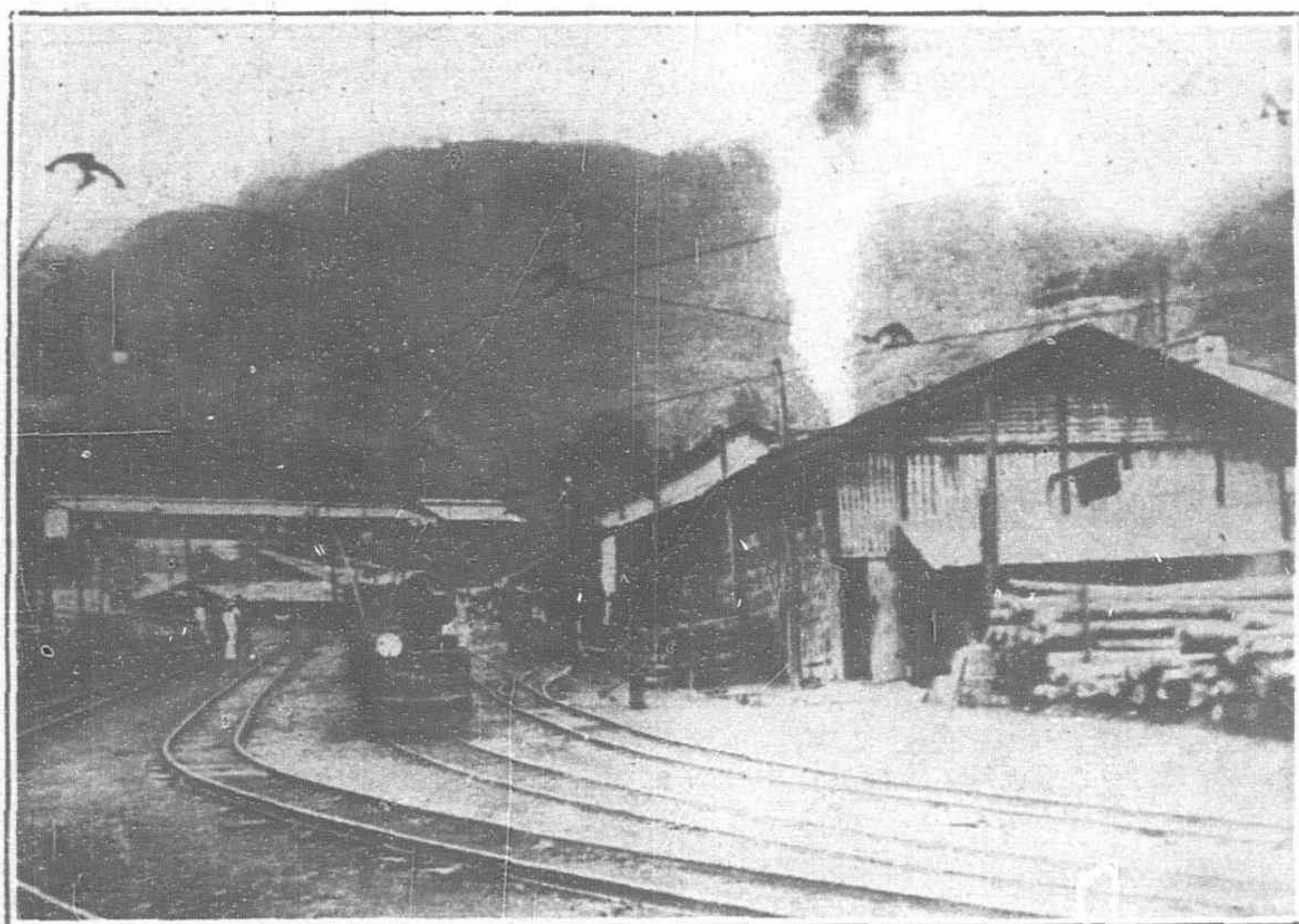


Briquette Factory and Coal Dressing Plant



Cable Tramway at Mine





Electric Locomotives at the Ombilin Coal Mine in Sumatra

Another private enterprise is the "Singkep Tin Company," to which a concession was granted in 1889 on the island of that name in the Riouw archipelago. The ore deposit is similar to that in Banka and Billiton and the mines are worked almost according to the same system. In the hills the ore is also mined by tunnels. Near Singkep tin ore is also found at the bottom of the sea, where it is worked by means of bucket dredges. The Singkep ore is smelted in Singapore.

The following statistics regard both these companies :—

Year of Report	Billiton Company		Singkep Company	
	Production in Tons (100 k.g.)	Share of Profits Paid to the D.E.I. Government in glds.	Production in Tons (1,000 k.g.)	
1919	7.835	4.599.829	729	
1920	7.677	2.560.577	618	
1921	11.533	nihil	719	
1922	10.793	data not available	672	

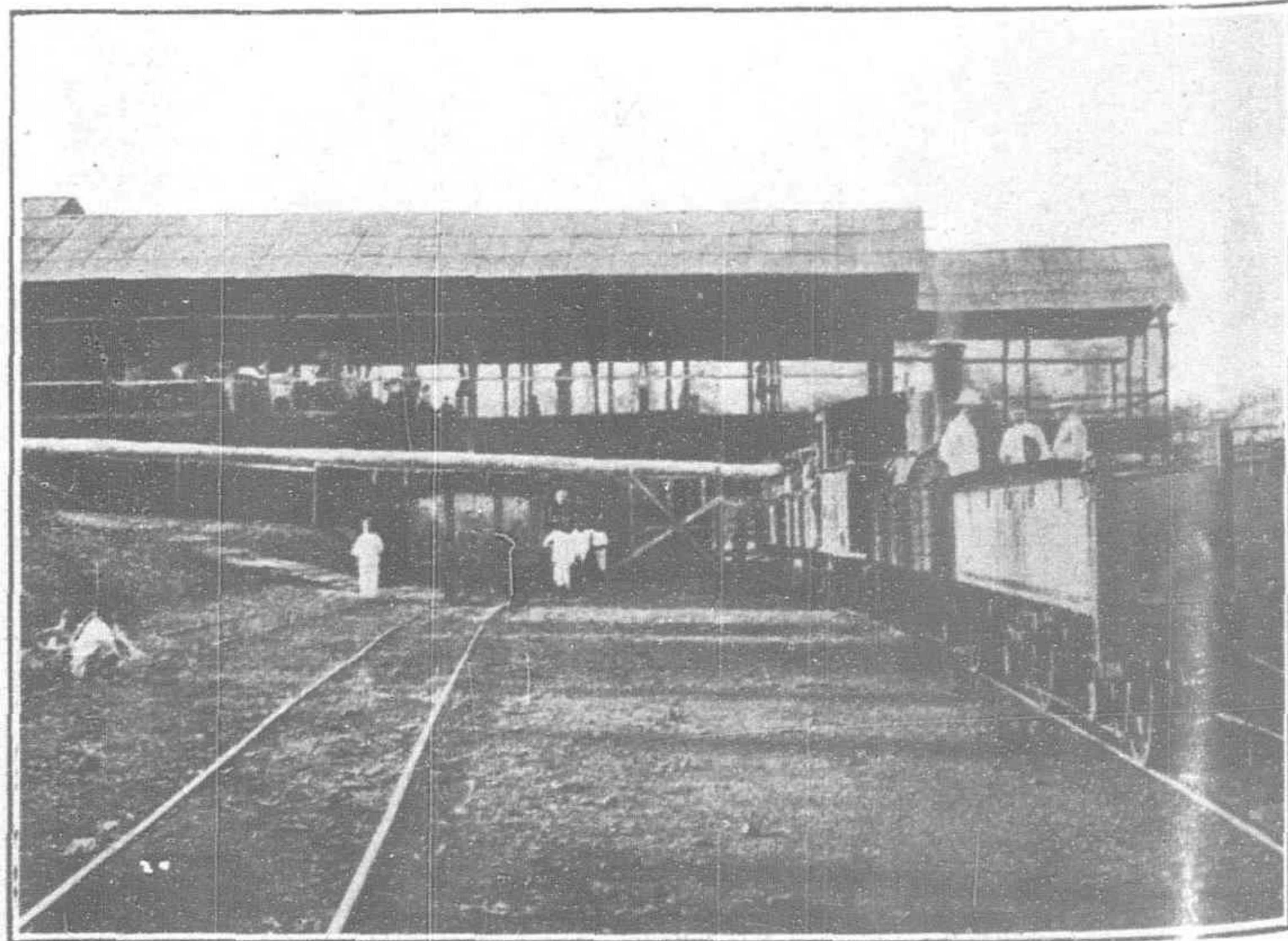
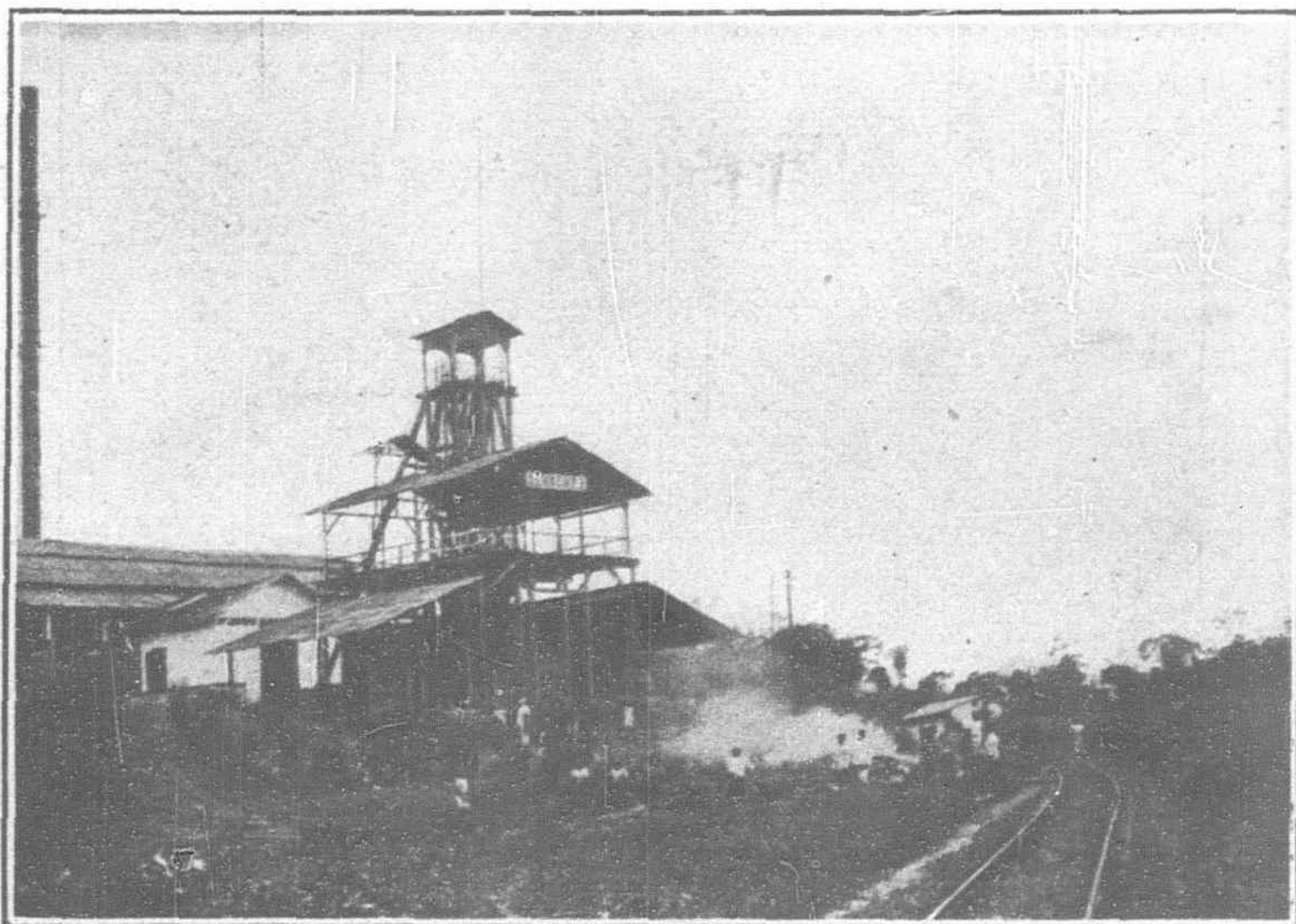
There are now three government coal enterprises : the Ombilin mines, the mine at Pulu Laut and the Bukit-Asem mines. The Ombilin mines are situated near Sawah Lunto in the Padang highlands, a region very famous for its beautiful scenery. Mining was started in 1892. For transport, a railway, 156 k.m. in length, was constructed. Owing to the hilly nature of the country, parts of the track are constructed as rackrail. The coal field extends for 10 k.m. in length and has a width of 9 k.m. The thickness of the seams varies, but is usually very great, some seams being as much as 12 metres wide. The coal in sight is estimated at 200,000,000 metric tons, of which a total of 7,291,425 tons was excavated from 1892 to 1919. The coal burns easily with a large, clear flame and only small quantities of ash. The mines so far have been worked entirely by means of tunnels with the aid of all kinds of modern technical machinery. Formerly the greater part of the production was sold to private buyers (in 1913 80 per cent., in 1914 76 per cent. of the total output), but during the years of war, on account of the

stagnation of foreign shipping, the government public services were supplied to a greater extent ; in 1916 : 28 per cent. ; in 1917 : 47.5 per cent. ; in 1918 : 48.62 per cent. ; in 1922 : 53.90 per cent. The coal, sold to private buyers, is partly taken in at Emmahaven (Padang) as bunker coal, partly shipped as freight coal to Tandjong Priok, Sourabaya and Macassar, where it is reshipped as bunker coal. In order to supply the need for coal in the archipelago during the years of war, the production was raised as high as possible and as far as available means allowed.

The laborers consist for the greater part out of convicts and Javanese contract coolies, the rest being made up out of local labor. At the end of 1922 the total number of laborers amounted to 9,396, among which were 4,822 convicts. On account of the continuous changing of these latter, the output per capita is very low. The hygienic conditions are generally favorable among the laborers ; the mortality resulting from sickness amounted to 1.4 per cent. among the Javanese contract laborers and 2 per cent. among the convicts. The death rate resulting from accidents amounted to a total of 2.65 per cent. in 1914, against 1.59 per cent. in 1917, 0.74 per cent. in 1918 and 1.09 per cent. in 1922.

An electric power plant provides the necessary power for the pumping machinery, underground transport by electric trolley locomotives, screening house, etc. Exploitation is carried on stopes, combined with hydraulic stowage. The following figures relate to the government coal mine :—

Year	Production in Tons (1,000 k.g.)	Book Value of the Enterprise in Glds.	Receipt in Glds.	Working Expense in Glds.	Net Profits After Deducting Share, Paid to the Sumatra R.R. in Glds.
1919	510,821	5,336.609	7,100,512	5,569,556	1,320,163
1920	567,142	7,194,842	12,792,718	7,803,656	4,658,441
1921	602,853	8,411,202	13,758,338	9,108,478	4,252,924
1922	544,002	—	7,976,402	—	—



Shaft No. 3 and Loading Station at the Poeloe Laoet Coal Mines in East Borneo



On the island of Pulu Laut, off the south-east coast of Borneo, a colliery has been worked by the government since October 1, 1913. The whole island is reserved by the government for mining and geological research. The centre of the coal industry is at Stagen, connected with the harbor by a railway of five kilometres. Mining is carried on in two seams. The island is favorably situated for the sale of its product, being in the direct route of shipping between South Africa, Australia, Java and Macassar, with China and Japan. In 1922 some 110,660 tons of coal were shipped, of which 37.5 per cent. was delivered to private parties and 62.5 per cent. to government services and industries. The work is chiefly done by Javanese contract coolies, the average number of which in 1922 amounted to 2,117.

The production from 1907 to October 1913, amounted to 902,295 tons, but reached 180,159 tons in 1919, 188,772 tons in 1920, 208,900 tons in 1921 and 113,218 tons in 1922.

The third government coal mine, Bukit Asem, is located near the dusun Tandjong, 12 k.m. south-west of Muara Enim in the Residency Palembang. For a long time various explorers had reported that coal was found in the highlands of this province but little attention was paid to this fact, because the mineral was brown coal. Owing to the proximity of volcanic rock (andesite), however, the coal at different places is metamorphosized into a superior quality. The geological research of 1915 proved that great quantities of this superior quality of coal were present near Tandjong. Firing tests gave favorable results, so, owing to the coal shortage in the Dutch East Indies and to supply the government railroads with necessary fuel, it was decided to start a mine on a small scale by way of experiment. The coal produced was at first transported from Tandjong to Muara Enim on a light railway, constructed in a short time by the government railway service, loaded into the cars of the South Sumatra government railway and conveyed to Palembang (Kertapati), where it was shipped in cargo steamers.

The better class coal is found in three seams, the upper, so-called Mangus seam, consisting of two banks 6 and 7 metres in thickness, intersected by a tuff layer from 4 to 5 metres thick, the middle so-called Suban seam, consisting of two strata of 8 and 3 metres, intersected by a stratum of clay 2 metres thick and the lower Petai seam from 6 to 8 metres in thickness. The seams are separated by clay shales and sand, from 15 to 25 metres thick. A fourth seam also occurs, the Merapi layer, at a depth of about 200 metres below the Petai seam. The coal is very pure, containing not more than 3 per cent. of ash, mostly but 1 to 2 per cent., but some kinds show an inclination to friability. During an optional contract closed by the government with the owners of the Lematang concessions, situated in this region, these concessions and the adjacent grounds were investigated. The result of this investigation was, that in 1919 the concessions were taken over by the government.

At present three kinds of coal are marketed: (1) Lematang marine coal with the qualities of semi-bituminous coal *i.e.*, fixed carbon 58-60, volatiles 36-38, moisture 2-5 per cent., ashes 1-3 per cent. and caloric value 13,000-14,500 B.T.U.; (2) Bukit Asem coal, with all the qualities of the bituminous coal averaging say 12,000 B.T.U.; (3) Briquette-coal of the semi-bituminous type with low volatiles and the average analysis of fixed carbon 80, volatiles 17, moisture 1, ash 2 per cent. and cal. value 14,500 B.T.U.

The coal is at present screened on grizzlies and separated in lumps and small coal (0-30 m/m); during this year a large screen-house will be put to work for producing in future lumps (larger than 30 m/m), nuts (10-30 m/m) and fines. Modern equipment, including an electric power plant, screenhouse, etc., will shortly be started to work. Underground transport will be done by compressed air locomotives. The production amounted in 1917 to 9,764 tons, in 1918 to 50,300 tons, in 1919 to 106,881 tons, in 1920 to 141,618 tons, in 1921 to 172,939 tons and in 1922 to 113,481 tons.

A mineralogical-geological research, instituted by the government, proved the existence of two gold and silver deposits of commercial value: Tambang Sawah and Lebong Simpang, both located in the district Lebong in the Residency Benkulen. The Tambang Sawah deposit chiefly contains manganese-bearing refractory silver ore, which will be worked according to a process discovered by the Engineer Caron. Owing to war conditions the necessary tests on a large scale could only be made in America, where they took place in the station for metallurgical research at Golden near Denver, with the co-operation and instruction of Professor Clevenger of the United States bureau of mines. An installation for a daily production of 150 tons has been installed lately.

During the time the tests were made, preliminary work was already carried out on the spot, while a road connecting the mine with the principal town of Muara Aman was constructed by the service of public works. The service of waterpower and electricity built an electric waterpower plant at Tais to supply the mine with electric power. This power plant will also provide more power to the adjacent Redjang Lebong mine. The work at Lebong Simpang was started in 1920 with a small plant. The power is supplied by a small waterpower station. In 1922 the production amounted to 70.5 k.g. of gold and 26.4 k.g. of silver.

From ancient times the Dutch East Indies had the reputation of being rich in gold, Java included, though this is the only island where no gold mines are found, the metal being found only rarely. At the end of the last century private enterprise discovered a number of places where gold was found, the result of which was that several mining companies were floated. The record of these companies on the whole has been unfavorable, but gradually sounder conditions have arisen. Gold is found in Sumatra, Borneo and Celebes in all kinds of deposits, such as alluvial deposits, tertiary gravel beds and as lode deposits. At the end of 1922 for the mining of gold and silver, 72 concessions had been granted.

The mining of the alluvial beds so far has been of small importance and dredging accordingly has met with little success. Natives are employed in the washing of river sediment. The more important mining companies confine themselves exclusively to the working of lode deposits. The greatest quantity of gold and silver is produced in the Residency Benkulen in Sumatra, where two mines are at present in exploitation and in the Residency West Coast of Sumatra, where one mine is at work.

The mining area, known by the name of the Lebong district (Lebong mine), is situated about 75 k.m. north of the capital and harbor of Benkulen, the Mangani mine on the west coast of Sumatra is situated near Pajacombo to the north of Fort de Kock. The veins sometimes extend as far as 4 k.m. Waterpower is everywhere available for the working of the ore. Another gold-mining district is to be found in the northern peninsula of Celebes, which, however, so far has failed to come up to expectations. At the present time there are three mines working. A third gold centre is located in Central Sumatra near Padang, where the mines have been producing since 1913.

Among the other minerals found in the Dutch East Indies, besides petroleum, mention should also be made of iodine, wolframite, manganese ore, sulphur and copper ore and also diamonds in Borneo. These mines are worked exclusively by private enterprises. Various springs in East Java produce iodine, which is mostly shipped to Europe in the form of copper iodide. In 1915 the production amounted to 50.5 tons (of 1,000 k.g.), in 1916 to 33 tons, in 1917 to 15.4 tons, in 1920 to 15.5 tons and in 1921 to 20.6 tons. Wolframite, manganese and sulphur are obtained in small quantities. The amounts of sulphur produced in 1911, 1912, 1913 and 1914 respectively, were 875, 305, 1236 and 300 tons (1,000 k.g.) while in the years 1915 up to and including 1922 only a very small amount was obtained. Marble quarries are found in Java, from which among other things the stone is worked into tiles. In 1922 the productions amounted to 500 M<sub>3</sub>. There are also a number of lime kilns and factories of building materials. Near Padang a Portland cement factory has been working since 1911. This factory has been enlarged and its capacity is now 480,000 barrels a year.

The results of the diamond digging in the archipelago suffered under war conditions in the second part of 1914. The greatest number of diamonds is found in the district of Martapura in the south and east division of Borneo. The number of licences granted for diamond digging amounted in 1922 to 7,055.

Gold and silver production in the Dutch East Indies:

Year	Gold in k.g.	Value in glds.	Silver in k.g.	Value in glds.	Value of Dia-
					mond produc- tion in glds.
1919	2,874	4,736,352	31,316	2,891,406	129,600
1920	2,757	4,543,536	31,752	3,015,805	50,000
1921	2,920	4,812,160	31,787	1,893,870	180,554
1922	3,244	5,346,112	34,515	1,997,728	168,843

### Petroleum

The development of the petroleum industry in the Dutch East Indies is comparatively new. The first concession was granted in 1883 in Langkat (North Sumatra) and has since been followed by several more. At the end of 1918 the number of concessions granted



and sanctioned by the Dutch East Indian government, amounted to respectively 61 and 26, of the latter 15 especially for petroleum and other bituminous substances.

The chief centres of production are located in the provinces : south and east division of Borneo, Palembang, Acheen, east Coast of Sumatra ; Rembang ; Sourabaya, Amboina (the island of Ceram). The products obtained from the crude oil are, among others : benzine, kerosene, residue or liquid fuel, lubricating oil, asphalt, and paraffin wax of which candles and batik wax are also manufactured. The oil from the various districts differs in appearance and composition, so that it can be worked into a large variety of products. The Sumatra oil, for instance, produces benzine, kerosene and lubricating oil, while the heavier Borneo oil yields kerosene, fuel oil and paraffin wax.

Benzine is put on the market in two grades : light and heavy, the one obtained from Sumatra is of the best quality. Great quantities are shipped to Europe. Kerosene or illuminating oil finds its chief market in Java, in British India, China, Japan, Australia and East Africa ; Alexandria is the most western market. Turpine serves as a substitute for turpentine. Diesel and Solar oil form intermediary products between kerosene and lubricating oil. Liquid fuel or petroleum residue is used as fuel in the refineries, while large quantities are shipped to different parts of the world. Batching oil finds a market in British India in the jute industry, where it is used to soften the fibres and to make them supple during the process of weaving. A modern plant for the distillation of engine oil is being constructed at Balikpapan, while two are working in Java and Sumatra. The refineries in Java and Borneo put a large quantity of the finest paraffin wax on the market. The one at Balikpapan is one of the largest and best equipped in the world. Part of the wax is used for the manufacture of candles which, on account of the high melting point of the Borneo paraffin wax, are particularly suitable for use in the tropics. The factory in Java caters for local consumption, the one at Balikpapan for export. Batik wax finds a market in Java in the domestic batik industry. Asphalt is sold partly on the local market and the remainder abroad. Tank steamers carry the products to all parts of the world. The greater part is shipped in bulk, but various ways of packing are adopted, for which purpose the tin factories supply the material.

The principal company, which controls almost the whole manufacture and output in the Dutch East Indies, though known under different names, is the "Royal Dutch Company for exploiting petroleum wells in the Netherlands Indies" (Koninklijke Nederlandsche My. tot exploitatie van petroleum-bronnen in Ned-Indië), which was founded in 1890. This company gradually established connections with various other companies for the buying of the crude product, its shipping and distribution, with the aim of securing for itself a place in the world market. Beyond the Dutch East Indies also, it is steadily extending its sphere of activity for that purpose. The Royal Dutch Petroleum Company presents an example of a world-wide organization, which has made it possible to bring the petroleum industry in the Dutch East Indies to a high degree of perfection. In 1921 a law was passed by which the "Nederlandsch-Indische Aardolie Maatschappij" was registered to exploit oil-fields in Djambi. In this company the government participates for half of the capital and according to a sliding scale in the profits. The company started work in 1922, two exploration drilling plants having been erected so far. Here follow some figures regarding the production and exports :

Export of Petroleum Products in 1,000 L.  
(incl. Pulu Sambu)

Year	Production of Crude oil in D.E.I. in tons	Benzine and Gasoline	Kerosene	Residue	Turpine
1919	2,159,862	573,045	406,807	754,423	2,200
1920	2,365,320	489,721	352,923	268,417	6,564
1921	2,359,343	538,764	322,446	268,584	3,052
1922	2,381,924	637,696	243,380	371,021	2,497

Export (in tons of 1,000 k.g.) of (incl. Pulu Sambu)

Year	Paraffin Wax	Candles	Lubricat- ing Oil	Asphalt	Greases
1919	22,797	5,626	27,056	2,647	208
1920	18,929	5,511	16,152	1,797	220
1921	22,408	4,001	11,326	1,181	364
1922	19,417	7,074	15,086	1,582	122

## Narrow-gauge Mallet Locomotives for Burma

Five metre-gauge locomotives of the compound articulated type have been recently completed by William Beardmore & Co., Limited, at their Dalmuir Works, and sent to Burma. The service on which they will be engaged is an extremely severe one, both as regards gradients and curves. At Leybyin for example, the line zigzags up a hillside with a steady gradient for 17 miles of 1 in 25 and curves of 337-ft. radius. At four places the train has to change direction, and the engine alternately pushes and pulls it up the hill. At Sedaw on the Northern Shan branch, a similar climb, 11 miles in length, has to be faced. These are possibly the worst parts of the many branches of the Burma railways, but gradients of 1 in 40 are quite common and the whole line is as difficult as it is picturesque.

The nature of the service explains the design of the engine. The driving wheels are 39-in. in diameter, while the high-pressure cylinders on the rear engine are 16-in. by 20-in., and the low-pressure cylinders on the leading engine are 24½-in. by 20-in. With a working pressure of 180-lb., the starting tractive effort is 30,000-lb. It will haul a train of 140 tons behind the tender up gradients of 1 in 25 at 10 miles an hour and trains of 220 tons up 1 in 40 at higher speeds. The boiler is of large capacity, having in all 1,180 square feet of evaporating surface and 224 square feet of superheater area. The grate has an area of 33 square feet. The steam distribution valves are of the piston type in the high-pressure and of the balanced slide type in the low-pressure cylinders. The lifting shackle fixed permanently to the first course of the boiler barrel is an interesting detail.

# SULZER

## BROTHERS

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